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WHAT IS NEW IN BRITISH COLUMBIA? EXPLORATION AND DEVELOPMENT HIGHLIGHTS - 1989

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INTRODUCTION

1989 was a year of exciting new discoveries in British Columbia, and also a year of change for mineral exploration. Junior companies maintained a prominent role on the provincial stage, with exciting new precious metal discoveries such as **Eskay Creek** and continuing encouraging results from **Mount Milligan** and **Windy Craggy**. The year also saw a resurgence of exploration for base metals and the return of the major companies as the biggest spenders, prompted by stronger base metal prices, particularly for copper and zinc.

After reaching record levels of $192 million in 1987 and $206 million in 1988, exploration expenditures are expected to total $135-140 million in 1989, a drop of 30 to 35 per cent from the previous year. This anticipated decrease is due to softening gold and silver prices through much of the year and the virtual demise of flow-through financing. Drastically reduced programs by junior companies are expected to total $55-60 million, versus the $143 million spent in 1988. This drop will be only partially offset by an increase in expenditures by major companies which are expected to reach $80 million versus the $63 million spent in 1988.

In contrast, mineral claim staking increased appreciably over 1988 and 1987 levels. Approximately 98 000 units are expected to have been recorded by the end of the year, compared to 87 285 in 1988, an increase of 12

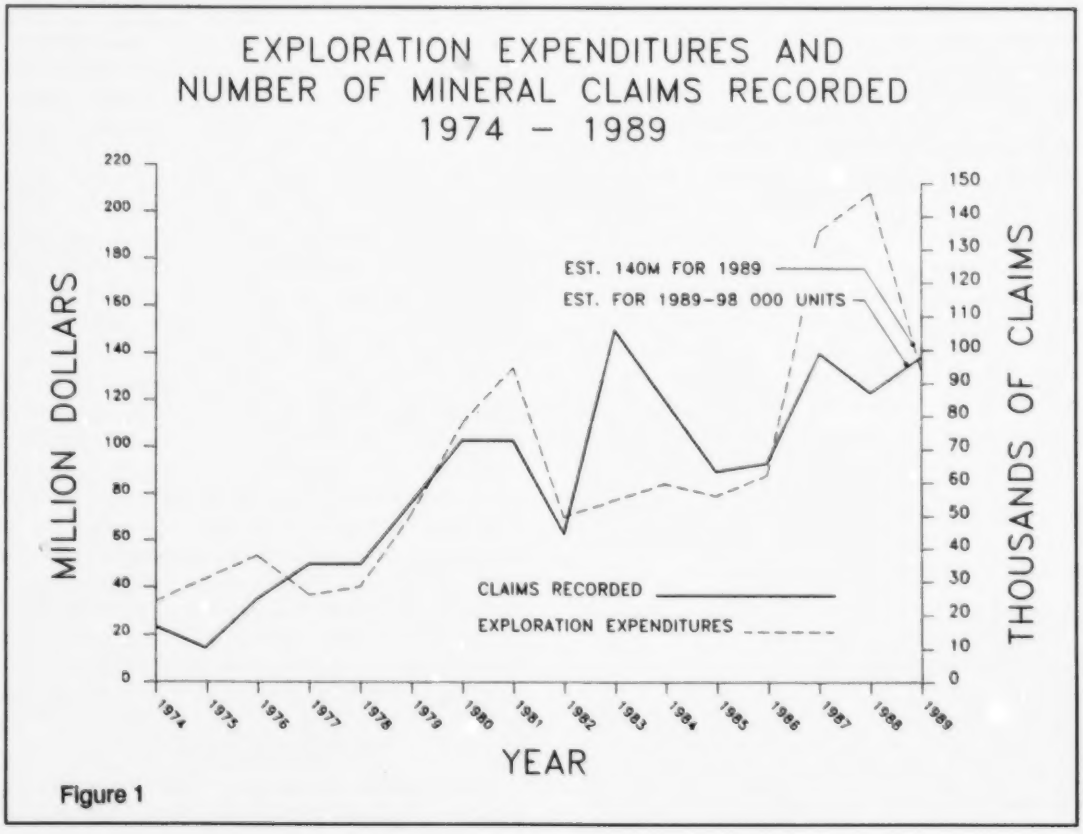


Figure 1

per cent (*see* Figure 1). What little ground that was still open in the Iskut - Unuk River area was gobbled up after the **Eskay Creek** news releases in August, and a staking rush ensued on Vancouver Island after the Regional Geochemical Survey release on June 20. The busiest mining divisions are Liard, Omineca and Skeena, all good hunting grounds for base and precious metals.

Total value of mineral production for 1989 is estimated at $4.0 billion, compared to $3.84 billion estimated for 1988. In 1988 copper continued to register the highest total value in the metal sector at an estimated $970 million. Gold was in second place with an estimated production of 13.2 million grams valued at $238 million. Gold production for 1989 is expected to reach 14.3 million grams valued at $220 million.

Although interest in precious metals, and in the Vancouver Stock Exchange, was significantly buoyed in August by the spectacular drilling results from the **Eskay Creek** property of Calpine Resources Incorporated, the softer gold and silver prices took their toll on the number of mines that were expected to open during the year. Of the seven anticipated precious metal projects, only four had come on stream at the time of writing: **Lawyers**, **Samatosum**, **Silbak Premier - Big Missouri** and **Golden Bear**. **Snip** and **Spud** are still being evaluated and their development is on hold, and **Tillicum Gold** was shut down indefinitely in early September. In contrast, the **Ajax** copper deposit of Afton Operating Corporation began production in July as planned, while other large base metal deposits such as **Windy Craggy**, **Mount Milligan**, **Mount Polley** and **Cirque** continued to be the object of very large surface drilling and underground exploration programs, and hold considerable promise of becoming large, company-sustaining producers.

Because of the renewed interest in base metals, exploration and development expenditures were distributed through several geologically distinct parts of the province, in contrast to 1988 when many large programs were in the rugged northwestern region and particularly in the Stewart - Iskut River - Unuk River Golden Triangle. Thus, of the major exploration plays in 1989, **Windy Craggy** (massive sulphide, Cu-Au-Co) is in the Insular Belt, **Eskay Creek** (epithermal Au-Ag) is in the Coast Belt, **Mount Milligan** and **Mount Polley** (alkalic Cu-Au porphyry) are in the Intermontane Belt, and **Cirque** (sediment-hosted Pb-Zn-Ag massive sulphide) is in the Foreland Belt.

In cooperation with several exploration companies active in the area, engineering studies to select a road corridor into the mineral-rich Iskut River and Unuk River areas have been funded by the Canada/British Columbia Mineral Development Agreement. The provincial government also removed two areas containing known mineral deposits at Lindquist Lake and Mount Alcock from Provincial Parks and established them as parts of new Recreation Areas, thereby allowing assessment of the two deposits.

As in previous years, the search for precious and base metals focused on five main geological settings which are briefly summarized below.

EPITHERMAL DEPOSITS

Classic epithermal systems in Mesozoic to Tertiary volcanic rocks continue to yield new important deposits. The **Lawyers** deposit of Cheni Gold Mines Inc., located in the Toodoggone River area 300 kilometres north of Smithers, began production early in the year (*see* Table 1).

In late August, a spectacular intersection of 201.2 metres grading 30 grams per tonne gold from drill hole No. 109 on the Eskay Creek property of Calpine Resources Incorporated, located in the remote Unuk River area, catapulted the Vancouver Stock Exchange from a state of lethargy into a frenzy of trading which saw all records broken for volumes of shares traded at the exchange. What is known of the **Eskay Creek** deposit at this time points to a large and very rich high-level precious and base metal-bearing hydrothermal system which includes deposits that range from exhalative gold-enriched massive sulphides to high-level gold-silver epithermal systems. Mineralization is hosted partly in argillaceous sedimentary rocks of the Lower Jurassic Hazelton Group (Mount Dilworth or Betty Creek formation) and partly in a footwall sequence of felsic volcanics. Although still at an early stage of exploration because of its large size and complexity, the **Eskay Creek** deposit has been reported to have a geological inventory of more than 11 million tonnes of open-pit ore, containing in excess of 143 million grams of gold and 5 billion grams of silver, and has all signs of becoming one of the most important precious metal deposits ever discovered in British Columbia.

In late September, Bond Gold Canada Inc. announced significant gold-silver intersections from drilling on its Red Mountain property, located on the east side of Bromley Glacier, 15 kilometres east of Stewart. Although very little is known about the geological setting of this exciting new discovery at this time, it appears to occur in similar stratigraphy, and have other similarities to the **Eskay Creek** deposit. The **Red Mountain** discovery is the result of a land acquisition and exploration program launched by Bond Gold after optioning claims on **Willoughby Creek**, 6 kilometres to the east, from prospector Charles (Chuck) Kowall who discovered significant gold-silver mineralization in 1988 while prospecting with support from the provincially funded FAME program.

In the south-central part of the province Canadian Nickel Co. Ltd. continued drilling on its **Vault** property, a

gold epithermal system in Eocene volcanic rocks, while Fairfield Minerals Ltd. and Placer Dome Inc. carried out trenching, sampling and other surface work with encouraging results on the **Elk** prospect, a quartz-sulphide vein system of possible Tertiary age, hosted in granitic rocks of the Jurassic Pennask batholith.

VOLCANOGENIC AND SEDIMENT-HOSTED MASSIVE SULPHIDE DEPOSITS

Paleozoic and Mesozoic submarine volcanic sequences continue to be intensively explored for various types of massive sulphide deposits while the strong price of zinc has renewed interest in lead-zinc-silver sediment-hosted deposits in Paleozoic sedimentary sequences. As expected, the **Samatosum** deposit of Minnova Inc. began production earlier in the year (*see* Table 1). Although this deposit is considered by many to be a large quartz vein, its setting and stratabound nature suggest that it may have originally been a distal volcanogenic exhalative deposit that was later recrystallized.

In the rugged extreme northwest corner of the province the **Windy Craggy** deposit of Geddes Resources Ltd. was the target of $14.1 million program. This is a world class copper-gold-cobalt volcanogenic deposit with recently calculated probable and possible reserves of 118.8 million tonnes grading 1.89 per cent copper, 0.2 gram per tonne gold and 0.08 per cent cobalt at a 1 per cent copper cut off. This deposit is still open along strike and at depth, and is currently the object of engineering studies examining the feasibility of a 7 to 9 million tonne per year operation.

Also in the rugged northwestern part of the province and only 50 kilometres northeast of Juneau, Alaska, the **Tulsequah Chief** (Cu-Pb-Zn-Ag-Au) deposit of Cominco Ltd. and Redfern Resources Ltd. was the object of a $1.8 million program of underground drilling and exploration. The program is reported to have achieved its objective of increasing geologically indicated reserves beyond the 5 million tonne level.

In the northeastern part of the province, the **Cirque** sediment-hosted massive sulphide-barite deposit of Curragh Resources Inc. was the object of a $10 million advanced underground exploration program. The deposit is located 280 kilometres north of MacKenzie, the nearest railhead, and has geological reserves of 34.6 million tonnes averaging 2.1 per cent lead, 7.8 per cent zinc and 47.0 grams per tonne silver.

Triumph Resources Ltd. carried out surface exploration work, including diamond drilling, on the nearby **Mount Alcock** deposit, another sediment-hosted massive sulphide-barite deposit. In the south-central part of the province Bethlehem Resources Corporation acquired the **Goldstream** copper-zinc deposit from Noranda and is making preparations to resume production. Noranda operated the Goldstream mine from May, 1983 to April, 1984, and at shut down, left behind a mineral inventory that is calculated by Bethlehem to be 1.8 million tonnes grading 4.8 per cent copper, 2.7 per cent zinc and 20.6 grams per tonne silver, using a 3 per cent copper cutoff.

In the Adams Lake area, Homestake Mineral Development Company continued with surface exploration work at the **Kamad 7** deposit, also a former producer with reserves of 220 000 tonnes grading 7.36 grams per tonne gold, 69.2 grams per tonne silver, 7.32 per cent zinc, 6.19 per cent lead and 0.54 per cent copper. Forty kilometres to the north, Minnova Inc. completed a surface drilling program at the **Chu-Chua** volcanogenic massive sulphide deposit, under option from International Vestor Resources Inc., Pacific Cassiar Ltd. and Quinterra Resources Inc., and is considering the feasibility of an open-pit operation. Reserves are 1 043 000 tonnes grading 2.97 per cent copper and 1.0 gram per tonne gold.

On Vancouver Island ongoing exploration was successful in finding at least one more massive sulphide lens at the **Myra Falls** mine of Westmin Mines Limited, a major copper-zinc-gold-silver producer. In the Chemainus area Minnova Inc. and Laramide Resources Ltd. continued exploration at the **Lara** property where drill-indicated reserves stand at 530 000 tonnes grading 4.73 grams per tonne gold, 100.11 grams per tonne silver, 5.87 per cent zinc, 1.01 per cent copper and 1.22 per cent lead.

North of Revelstoke, Equinox Resources Ltd. continued its reassessment of the **J & L** deposit which has drill-indicated reserves of 808 000 tonnes grading 7.2 grams per tonne gold, 65.7 grams per tonne silver, 5.2 per cent zinc, 2.5 per cent lead and 4.7 per cent arsenic.

PORPHYRY DEPOSITS

Alkalic or syenitic porphyry copper-gold systems in Upper Triassic to Lower Jurassic volcanic sequences of the Intermontane Belt continue to be one of the hottest exploration targets in the province.

Near Kamloops the **Ajax** deposit of Afton Operating Corporation began production in July (*see* Table1). In the Quesnel trough south of Prince George the **Mount Polley** deposit of Imperial Metals Corporation and Corona Corporation is at the feasibility study stage. Estimated open-pit reserves are 48.6 million tonnes averaging 0.44 per cent copper and 0.61 gram per tonne gold. Nearby the **Q.R.** deposit of QPX Minerals Inc. is at the production decision stage with reserves of 814 000 tonnes averaging 4.5 grams of gold per tonne.

North of Prince George the Omineca region has been buzzing with activity driven by the continued success of a very large and on-going surface drilling program at the **Mount Milligan** deposit of Continental Gold Corporation and B.P. Resources Canada Ltd. To the end of November 1989, in excess of $11 million had been spent on this property and a $2 million budget was recently secured for further work. Approximately 100 000 metres had been drilled in 400 holes. Five diamond drills are on the property systematically testing a 15 square kilometre sulphide system and the current drilling rate is approximately 11 000 metres per month. Although no ore reserves have yet been calculated for this property, geological inventory has been reported as being in the 180 million tonne range for the **MBX** zone and 90 million tonnes for the **Southern Star** zone, grading 0.3 per cent copper and 0.78 gram per tonne gold. At least three distinct copper-gold zones had been identified up to August, and three new ones have been reported more recently.

Current plans for Mount Milligan are to complete a bankable feasibility study by mid-1990. Production at 45 000 tonnes per day is contemplated by late 1992 to early 1993. If this is achieved, this deposit will produce 12.4 million grams (400 000 ounces) of gold and 45 000 tonnes of copper annually, thereby effectively doubling the current provincial gold production and significantly reducing the shortfall in copper production resulting from anticipated closure of a number of copper mines.

Success at **Mount Polley** and **Mount Milligan** has rekindled interest in the entire Intermontane tectonic belt, and particularly in the Omineca Belt north of Prince George. This has triggered extensive staking of any available prospective ground and the launching of several significant projects on properties such as **Tas** of Noranda Exploration Company, Limited and Black Swan Gold Mines Ltd., **Windy** of Placer Dome Inc., **Col** of Kookaburra Gold Corporation, **Cat** of B.P. Resources and Lysander Gold Corporation, and other very interesting properties, near Witch and Chuchi Lakes, which are being explored by Noranda and Digger Resources Ltd.

In the rugged Unuk River – Stikine River region, work continued on the **Kerr** property of Sulphurets Gold Corporation, Placer Dome Inc. and Western Canadian Mining Corporation which has geological reserves of 60 million tonnes grading 0.86 per cent copper and 0.343 gram per tonne gold with excellent potential for expansion, while Mingold Resources Inc. carried out a major resampling program on the **Galore Creek** deposit which has been known since the 1950s to have drill-indicated reserves of 113 million tonnes grading 1.06 per cent copper, 0.445 gram per tonne gold and 8.57 grams per tonne silver. On Vancouver Island, Falconbridge Limited carried out a major resampling and drilling program at its **Catface** copper-gold property near Tofino.

TRANSITIONAL DEPOSITS

These deposits formed in a transitional setting between the classic epithermal environment and the deeper seated porphyry environment. Most of them are found in British Columbia's Golden Triangle and include one of the province's newest mines, the **Silbak-Premier** of Westmin Mines Limited, Canacord Resources Inc. and Pioneer Metals Corporation, with reserves of 7.5 million tonnes grading 2.4 grams per tonne gold and 69.60 grams per tonne silver. Some 40 kilometres to the northwest, the **Sulphurets** property of Newhawk Gold Mines Limited continued to be the target of a major underground exploration program. This property has drill-indicated reserves of 854 000 tonnes grading 11.99 grams per tonne gold and 785.12 grams per tonne silver. Another 50 kilometres farther to the northwest the **Snip** deposit of Cominco Ltd. and Prime Resources Ltd. continues to be explored on surface and underground, and has an inventory of 1.57 million tonnes grading 21.94 grams per tonne gold.

GOLD SKARNS

Although recent down-grading of reserves at the **Nickel Plate** mine of Corona Corporation and the early September closure of the **Tillicum Mountain** project of Esperanza Exploration Ltd. have cooled the interest in this type of precious metal target somewhat, interest continued in deposits of this type in the Insular and Omineca belts. South of Nelson at the **Second Relief** property, a past producer which has yielded 2.8 million grams of gold, Hawkeye Developments Ltd. intersected significant gold mineralization. In the Port McNeill area of Vancouver Island, Taywin Resources Ltd. successfully outlined areas of significant gold-copper mineralization at the **Merry Widow** mine, a former iron producer, while on Texada Island, Freeport-McMoRan Gold Company met with some success in outlining new areas of copper-gold mineralization at the **Little Billie** property, under option from Vananda Gold Ltd.; Echo Bay Mines Ltd. explored other skarn prospects at the north end of the island, optioned from Rhyolite Resources Inc.

OTHER SIGNIFICANT DEPOSITS

A number of other precious metal deposits, many of them mesothermal veins or replacements associated with major high-angle faults or thrust faults and commonly displaying listwanite alteration, are definitely highlights on the British Columbia scene.

The **Golden Bear** deposit of Golden Bear Operating Company and Homestake Mining (BC) Ltd., located west of Dease Lake, is British Columbia's newest gold mine with reserves of 1.63 million tonnes grading 11.0 grams

per tonne gold. Mineralization at Golden Bear occurs in silicified and breccia zones along a major fault which juxtaposes Permian limestone and Upper Triassic andesites.

The **Debbie-Yellow** property of Westmin Mines Limited and Nexus Resources Ltd. located near Port Alberni on Vancouver Island has gold mineralization in veins and in extensive quartz-carbonate-pyrite alteration zones associated with major north-trending faults, as well as in a magnetite-jasper-sulphide-bearing chert with quartz-vein stockwork in a footwall basalt. Westmin recently completed a 2-kilometre tunnel in preparation for a major underground drilling and sampling program.

Major programs involving surface and underground drilling and sampling were carried out on a number of gold-bearing mesothermal vein systems including **Polaris Taku** of Suntac Minerals Corporation, **Erickson Gold/Cusac** of Total Energold Corporation, **Porcher Island** of Cathedral Gold Corporation, **Lindquist Lake** of Golden Knight Resources Inc., and **Dome Mountain** of Canadian United Minerals Inc. and Teeshin Resources Ltd. In the Iskut River area Gulf International Minerals Ltd. completed a major drilling program with encouraging results on its **McLymont Creek** property, a replacement deposit with skarn and porphyry affinities. In the southern part of the province Bethlehem Resources Corporation obtained encouraging results and discovered new zones of mineralized breccia on its **Giant Copper** property east of Hope. Results of this program should improve current reserves of the **AM** zone which are 2.45 million tonnes grading 1.25 per cent copper, 0.5 gram per tonne gold, and 22 grams per tonne silver. North of Nelson, Cominco Ltd. intersected significant lead-zinc mineralization on its Duncan Lake property, 2 kilometres north of the old **Duncan** mine, significantly increasing the reserve potential on this property. Near Burton, Greenstone Resources Ltd.completed an extensive drilling and mapping program at its **Millie Mac** property where gold mineralization occurs in quartz-graphite "augens" in a gently dipping graphitic fault zone.

Although coal exploration remains at a very low level and almost exclusively confined to operating mines, somewhat improved markets and a considerably improved outlook for thermal coal have prompted Crows Nest Resources Limited to shift its **Telkwa Coal** project into high gear. Current plans are to bring this large and strategically located deposit of thermal coal into production at 1.0 million tonnes of clean coal per year within two years.

SUMMARY AND A LOOK AT 1990

In summary, 1989 produced exciting new discoveries and developments which hold great promise for the future of mining in British Columbia. Four new precious metals mines began production. While **Eskay Creek** is still under assessment, it is undoubtedly a very significant discovery which produced one of the most spectacular gold-silver intersections ever drilled in the province.

On the base metal scene **Mount Milligan**, **Mount Polley**, **Windy Craggy** and **Cirque** all made very significant progress towards development and hold considerable promise of becoming large, company-sustaining producers.

Although exploration expenditures decreased by roughly one third from the 1988 record of $206 million, a firming of the price of gold and the outlook for continuing strong base metal prices should ensure that exploration in 1990 will continue at least at current levels. Continued interest in base and precious metals will ensure that the search for a variety of mineral deposit types will continue strong throughout the province. The resurgence of base metal exploration will ensure that existing or anticipated road access will be an important factor in the choice of areas to explore while the considerable successes of 1988 will continue to attract exploration for precious metals in more remote areas.

TABLE 1
OPERATING MINES IN BRITISH COLUMBIA, 1989

MAP No. *Fig. 1*	MINE	OWNER	MINING DIVISION	TONNES MILLED (000's)	RATED CAPACITY (TPD)	% ANNUAL RATED CAPACITY	DEPOSIT TYPE	RESERVES/PRODUCTION
NORTHWESTERN DISTRICT								
11	Barrington River	Integrated Resources Ltd.	Liard				Placer Au	2574 m^3 mined; 3806 g Au recovered
18	Johnny Mountain (Reg)	Skyline Gold Corp.	Liard	90.93 (Jan/Oct)	270	99	Mesothermal Au-Ag-Cu Vein	Production: 1598 kg Au, 2688 kg Ag, 544 t Cu (Jan/Oct)
27	Silbak Premier/Big Missouri	Westmin Mines Limited	Skeena	303.55	2000	96	Ag-Au Vein	Production: 359 kg Au, 5288 kg Ag (Jun/Oct)
46	Lawyers	Cheni Gold Mines Inc.	Omineca	151.59	500	92	Epithermal Au-Ag	Production: 1567 kg Au, 32044 kg Ag
47	Shasta	Sable Resources Ltd.	Omineca	12.25 (Oct/Dec)	180	77	Epithermal Ag-Au	Production: 30.9 kg Au, 2145 kg Ag
55	Bell	Noranda Minerals Inc.	Omineca	5500	15 400	98	Porphyry Cu-Au	Production: 18.5 kt Cu, 860 kg Au, 3149 kg Ag
69	Pine Creek	Queenstake Resources Ltd.	Atlin				Placer Au	764 554 m^3 mined; 233.1 kg fine Au recovered
70	Spruce Creek	Queenstake Resources Ltd.	Atlin				Placer Au	382 277 m^3 mined; 144.0 kg fine Au recovered
71	Golden Bear	Golden Bear Operating Co.	Atlin	1.62	360	Start-up	Replacement Au	41.19 kt mined open-pit; 3.86 kt mined u/g
72	Cassiar	Cassiar Mining Corp.	Liard	1165	3600	89	Asbestos	1.6 Mt stockpiled June '89
73	Equity Silver	Equity Silver Mines Ltd.	Omineca	3100	8500	100	Transitional Ag-Au-Cu	Production: 220 000 kg Ag, 1800 kg Au, 6300 t Cu
SOUTHWESTERN DISTRICT								
108	Myra Falls/ Lynx,Myra, Price	Westmin Mines Ltd.	Alberni	4 000			Volcanogenic massive sulphides	Reserves (Jan. 1989): 12.1 Mt @ 2.34% Cu, 0.35% Pb, 5.19% Zn, 2.4g/t Au, 34.3 g/t Ag
109	Island Copper/ Bay, Road	BHP-Utah Mines Ltd.	Nanaimo	50 000			Porphyry	Reserves: ~ 53 Mt @ 0.48% Cu, 0.023% Mo, 0.24g/t Au
110	Quinsam	Brinco Coal Corp.	Nanaimo				Coal	Production: 200 kt thermal coal from open pit
SOUTH-CENTRAL DISTRICT								
163	Nickel Plate	Corona Corporation	Similkameen	936.4	2 903	88	Skarn Au-Ag	Reserves: 7.43 Mt @ 2.57 g/t Au
189	Copper Mountain	Similco Mines Ltd.	Similkameen	7 500	22 680	91	Porphyry Cu-Au-Ag	Reserves: proven; 36 Mt @ 0.45% Cu; probable, possible 81.6 Mt @ 0.43% Cu
190	Afton/Ajax	Afton Operating Corporation	Kamloops	2 597	7 112	100	Porphyry Cu-Au	Reserves: 23.15 Mt @ 0.46% 0.34 g/t Au
191	Highland Valley Copper	Highland Valley Joint Venture	Kamloops	33 000	126 000	72	Porphyry Cu-Mo	Reserves: 736 Mt @ 0.4% Cu, 0.007% Mo
192	Samatosum	Minnova Inc.	Kamloops	102.8	454	62	Polymetallic massive sulphide	Reserves: 670.8 kt @ 834 g/t Ag 1.6 g/t Au, 1% Cu, 3% Zn, 1% Pb

193	Brenda	Brenda Mines Ltd.	Osoyoos	13 940	32 300	118	Porphyry Cu-Mo	Reserves: 7.5 Mt @ 0.17% Cu, 0.035% Mo
194	Highland Bell	Teck Corporation	Greenwood	36.3	100	100	Ag-Pb-Zn Vein	
195	Candorado	Candorado Mines Ltd.	Similkameen	97.3	0.8	0.33	Tailings recovery	Reserves: 1.3 Mt @ 1.37 g/t Au
KOOTENAY DISTRICT								
223	Fording River	Fording Coal Ltd.	Fort Steele	6 020.4	15 900	104	Coal	Production: 5.0 Mt metallurgical coal, 0.4 Mt thermal blend, 0.35 Mt thermal coal
224	Line Creek	Crows Nest Resources Ltd.	Fort Steele	2 094.9	10 400	55	Coal	Production: 1.26 Mt metallurgical coal, 0.65 Mt thermal coal, development drilling on Natal Ridge (2000 m) metallurgical coal, 80 kt thermal coal, 70 kt special blend
225	Balmer	Westar Mining Ltd.	Fort Steele	6 462.6	26 000	68	Coal	Production: 5.8 Mt metallurgical coal 75 kt thermal coal
226	Greenhills	Westar Mining Ltd.	Fort Steele	3 053.8	9 900	85	Coal	Production: 2.46 Mt metallurgical coal, 0 33 Mt thermal coal, 0.31 Mt special-blend coal
227	Coal Mountain	Byron Creek Collieries	Fort Steele	1 030.1	4 930	57	Coal	Production: 0.9 Mt thermal coal
228	Sullivan	Cominco Ltd.	Fort Steele	2 038.1	7 300	76	Coal Sedex Zn-Pb-Ag	Reserves: 23 Mt @ 4.6% Pb, 7.1% Zn, 29 g/t Ag
229	Mt. Brussilof	Baymag Mines Ltd.	Fort Steele				Magnesite	pit development, 25 ddh
230	O.B. - Skylark	Viscount Resources Ltd.	Greenwood	n/a	custom milled	n/a	Ag-Au vein	Reserves: 25.2 kt @ 687 g/t Ag, 3.1 g/t Au, closed April 89
231	Sylvester K	Kettle River Resources Ltd./ Skylark Resources Ltd.	Greenwood				Au	mined 8000 t
232	Silvana	Dickenson Mines Ltd.	Slocan	27.8	90	84	Ag-Pb-Zn-Cd vein	massive sulphides Milling rate:100 tpd; reserves: 29.1 kt @ 403 g/t Ag,4.4% Pb, 5.1% Zn 5.0% Pb, 5.8% Zn
CENTRAL DISTRICT								
270	Endako	Placer Dome Inc.	Cariboo	5900	29 600	63	Porphyry Mo	Reserves:109 Mt @ 0.081% Mo
271	Gibraltar	Gibraltar Mines Ltd.	Cariboo	13 245	38 100	75	Porphyry Cu-Mo	Reserves:185 Mt @ 0.31% Cu, 0.009% Mo Production:27 kt Cu in concentrates and 4.5 kt cathode Cu from electrowinning plant
272	Blackdome	Blackdome Mining Corp.	Clinton	80.5	200	115	Epithermal vein	Reserves:133 kt @ 20.2 g/t Au, 64.1 g/t Ag Production: 1555 Kg Au
273	Bullmoose	Bullmoose Operating Corp.	Liard	1800	6300	77	Coal	Reserves:66.5 Mt metallurgical coal Production: 1.8 Mt metallurgical coal
274	Quintette	Quintette Coal Ltd.	Liard	4200	17 260	67	Coal	Reserves: 226.8 Mt metallurgical coal 4.45 Mt thermal coal Production: 4.2 Mt metallurgical coal

** Annual rated capacity = daily rated capacity x 365*

TABLE 2
MINE DEVELOPMENT REVIEW PROCESS (MDRP)
PROJECTS IN REVIEW, DECEMBER, 1989

Prospectus STAGE

PROJECT/COMPANY DEVELOPMENT REGION	COMMODITY/PRODUCTION RATE*/MINE LIFE	EMPLOYMENT (CONSTRUCTION/ OPERATION)/COMMUNITY	DEVELOPMENT SCHEDULE (STAGE/AIP**/PRODUCTION)
Crystal Peak/Polestar Exploration Inc. Thompson-Okanagan	Garnet 100 - 200 stpd for 20 yrs	Total: 6 Apex Village, Penticton	Prospectus - Sept 1989 Review on-going

STAGE I (or equivalent)

PROJECT/COMPANY DEVELOPMENT REGION	COMMODITY/PRODUCTION RATE*/MINE LIFE	EMPLOYMENT (CONSTRUCTION/ OPERATION)/COMMUNITY	DEVELOPMENT SCHEDULE (STAGE/AIP**/PRODUCTION)
Canty (Nickel Plate Extension)/Corona Corp., Golden North Resource Corp. Thompson - Okanagan	Au 907 tpd for 15 months	Existing employment Penticton	Focused Stage I - Nov 1989 Review on-going Prod. - 1990
Cirque/Curragh Resources Inc. Northeast	Pb, Zn, Ag 3500 tpd for 16+ yrs	Constr: 200 Op: 250 Fort St. John, MacKenzie, Prince George	Stage I - Spring 1990 Prod. - 1991
Equinox (J&L)/Equinox Resources Ltd., Pan American Minerals Corp. Thompson-Okanagan	Au, Ag, Pb, Zn 350 tpd for 10 yrs	Constr: 50 person yrs Op: 80 - 90 Revelstoke	Stage I - 1990 Prod. - 1991
Golden Crown/ Atwood Gold Corp. Kootenay	Au, Cu 200 stpd for 2 yrs	Op: 20-30 Grand Forks	Stage I - Early 1990 Prod. - 1990
Goldwedge/ Catear Resources Ltd. North Coast	Au, Ag 181 tpd for 6-10 yrs	Constr: 50 Op: 30 Campsite, Stewart	Stage I - July 1989 Review on-going Prod. - 1990
Mount Polley/Imperial Metals Corp., Corona Corp. Cariboo	Cu, Au 13 600 tpd for 10 yrs min	Constr: 250 person yrs Op: 250 Williams Lake	Stage I - Early 1990 Prod. - 1991
Quesnel River/QPX Minerals Inc., Placer Dome Inc. Cariboo	Au 400 tpd for 7 yrs	Constr: 42 Op: 28 Quesnel	Stage I - July 1989 Review on-going Prod. - 1991
Snip/Cominco Ltd., Prime Resources Corp. North Coast	Au, Ag 300 tpd for 13 yrs min	Constr: 120 Op: 165 Smithers, Vancouver	Stage I - Sept 1988 Review on-going Prod. - 1990
Spud/McAdam Resources Inc. Island-Coast	Au 90 - 185 tpd for 3 - 4 yrs	Constr: 15 - 20 Op: 20 - 25 Zeballos	Pilot plant - Fall 1989 Stage I - Spring 1990 Full Prod. - 1990
Windy Craggy/ Geddes Resources Ltd. Nechako	Cu, Co, Au, Ag 15 000-25 000 tpd for 30+ yrs	Constr: 2000 person yrs Op: 600 Whitehorse	Access Assessment - In progress Stage I - Jan 1990

STAGES II/III

PROJECT/COMPANY DEVELOPMENT REGION	COMMODITY/PRODUCTION RATE*/MINE LIFE	EMPLOYMENT (CONSTRUCTION/ OPERATION)/COMMUNITY	DEVELOPMENT SCHEDULE (STAGE/AIP**/PRODUCTION)
Cinola/City Resources Canada Ltd. North Coast	Au, Ag 3500-6000 tpd for 9-15 yrs	Constr: 225 Op: 190 Port Clements, Skidegate, Massett	Stage II - June 1988 Review on-going
Hellroaring Feldspar/ Lumberton Mines Ltd. Kootenay	Feldspar 50 000 t bulk sample	Cranbrook, Kimberley	Stage III Permitting Kootenay Mine Development Review Committee review
Mount Klappan/Gulf Canada Resources Ltd. Nechako	Anthracite coal 1.5 million tpy for 20 yrs	Constr: 975 Op: 750 Stewart, Dease Lake, Terrace, Smithers	Stage II - Apr 1987 AIP - Uncertain Prod. - Uncertain
Nanaimo Coal/ G. Hoberstorfer Island-Coast	Thermal coal 365 000 - 450 000 tpy for 5 yrs	Total: 70 Nanaimo	Stage III Permitting Vancouver Island Mine Development Review Committee review
Shasta/Baker Gold, Sable Resources Ltd., International Shasta Resources Ltd. Northeast	Au 180 tpd for 2-3 yrs Reactivation of old mill	Op: 26 Smithers, Terrace	Prospectus - July 1989 AIP - Nov 1989
Silbak Premier Province Zone/ Westmin Resources Ltd. North Coast	Au, Ag 252 000 t total for 2 yrs Feed for existing mill	Existing employment Stewart	Stage II - Aug 1989 Prod. - 1991
Twin Lakes/ Brenna Resources Thompson-Okanagan	Au 200 000 + st total Reclamation of old gold tailings	Oliver, Okanagan Falls	Stage III - Permitting South Central Mine Development Review Committee review

* *Metric tonnes per day (tpd)*
Short tons per day (stpd)
** *Approval-In-Principle (AIP)*

SOURCE: Engineering and Inspection Branch, 01/01/90

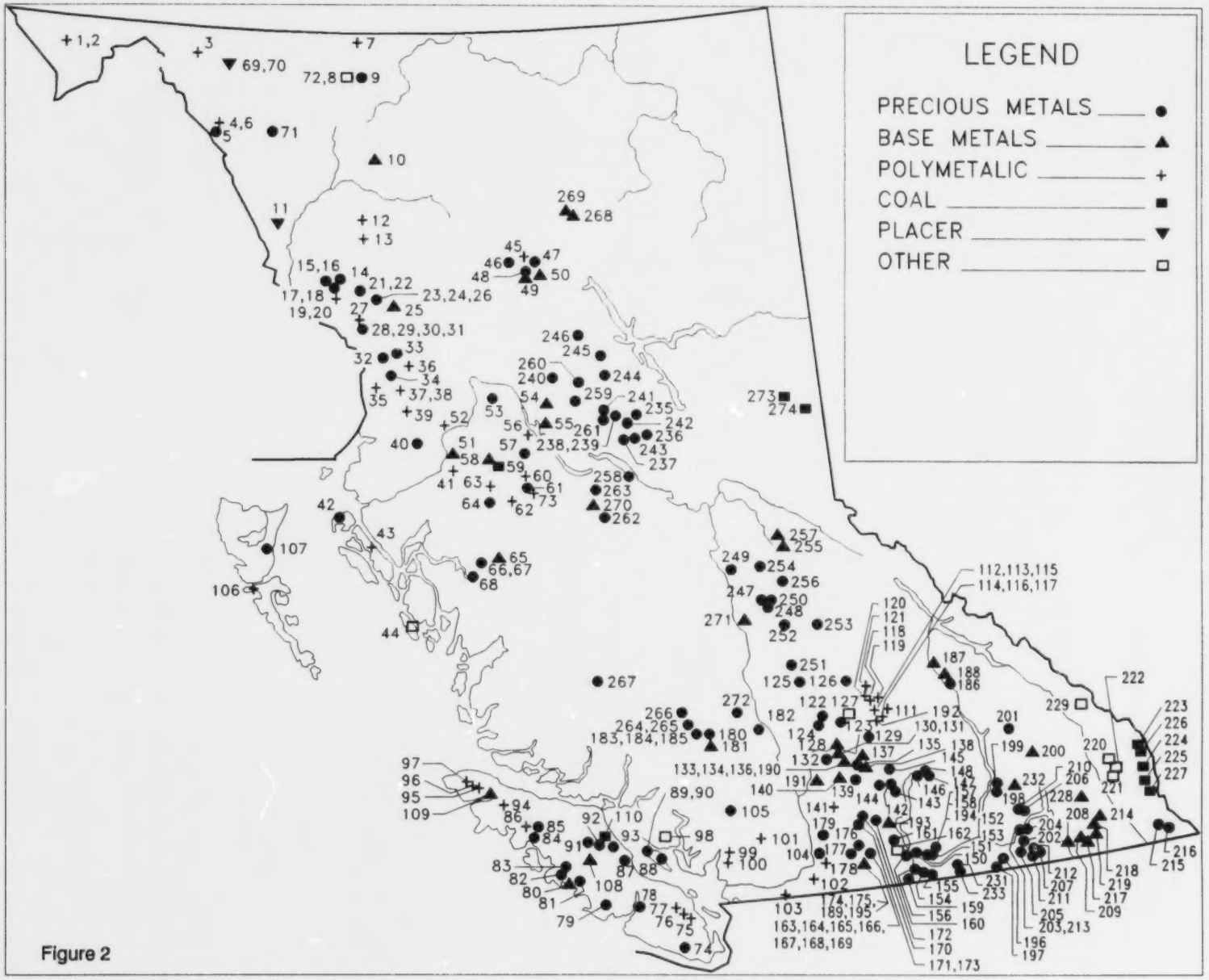

LEGEND
PRECIOUS METALS
BASE METALS
POLYMETALIC
COAL
PLACER
OTHER

Figure 2

TABLE 3
ACTIVE EXPLORATION PROPERTIES IN BRITISH COLUMBIA, 1989

MAP No.	PROPERTY/ (OWNER/OPERATOR)	MINFILE No.	MINING DIVISION	NTS	COMMODITY	DEPOSIT TYPE	WORK DONE
NORTHWESTERN DISTRICT							
1	Windy Craggy (Geddes Resources)	114P 002	Atlin	114P/12E	Cu, Co, Au, Ag, Zn	Volcanogenic massive sulphide	1362 m drifting; 700 m surface ddh; 23 500 m u/g ddh; bulk sampling
2	Rime (East Arm) (Bond Gold Canada)	114P 061	Atlin	114P/12E	Au, Ag, Cu Pb, Zn, Co	Volcanogenic massive sulphide	4 ddh, 1054 m; mag; UTEM
3	Teepee (Auspex Gold/Cyprus Gold)	104M 048	Atlin	104M/10E	Au, Ag, Pb Zn,	Vein	13 ddh, 1371 m; rock and soil geochem; VLF-EM; CEM
4	Tulsequah Chief (Redfern Resources/ Cominco)	104K 002	Atlin	104K/12E	Ag, Au, Pb Zn,Cu	Volcanogenic massive sulphide	174 m drifting; 10 u/g ddh, 4880 m
5	Polaris Taku (Rembrandt Gold Mines/ Suntac Minerals)	104K 003	Atlin	104K/12E	Au, Ag, Cu Sb	Vein	20 ddh 4575 m; geochem; u/g rehabilitation
6	Banker (Silver Talon Mines/ Sunport Metals)	104K 007	Atlin	104K/12E	Ag, Au, Pb Zn, Cu	Vein	5 ddh, 915 m
7	Midway (Regional Resources/ Strathcona Mineral Services)	104O 038	Liard	104O/16W	Ag, Pb, Zn Au, Sn, Cu	Manto	pumped out old workings; rehabilitated camp facilities
8	McDame (Cassiar Mining)	104P 084	Liard	104P/05E	Asbestos	Ultramafic	drift rehabilitation; 13 u/g ddh, 2480 m
9	Erickson (Total Energold/ Erickson Gold Mining)	104P 029	Liard	104P/04E	Au	Mesothermal vein	37 ddh, 4060 m; 1375 m drifting; VLF; mag
10	Gnat Pass (June-Stikine) (Integrated Resources)	104I 001	Liard	104I/05W	Cu, Au	Porphyry	8 ddh, 915 m; trenching
11	Barrington River (W. Eberg/Integrated Resources)	104G 008	Liard	104G/12W	Au	Placer	2574 m^3 gravel moved; 5 rdh, 140 m
12	Spectrum (Calnor Resources/Cominco)	104G 036	Liard	104G/09W	Au, Ag, Cu Pb, Zn	Vein	10 ddh, 1198 m; mapping
13	Hank (Lac Minerals)	104G107	Liard	104G/01W	Au, Ag, Zn Pb, Cu	Vein	11 ddh
14	McLymont (Gulf International Minerals)	104B 281	Liard	104B/15	Au, Cu, Ag	Replacement	ddh, 7165 m; mapping; VLF; mag

15	Iskut (Golden Band Resources, American Ore/Prime Resources)	104B 356	Liard	104B/11E	Au		10 ddh
16	Iskut River (Hughes-Lang)	104B 076	Liard	104B/11	Au, Cu, Mo	Porphyry ? vein?	33 ddh, 3136 m
17	Snip (Prime Resources/Cominco)	104B 250	Liard	104B/11E	Au	Mesothermal vein	489 ddh, 29 368 m; 2200 m drifting
18	Johnny Mountain (Reg) (Skyline Explorations)	104B 107	Liard	104B/11E	Au, Ag, Cu	Mesothermal vein	126 ddh, 16 460 m, surface; VLF; mag; EM; mapping; drift decline to 1035 m
19	Bronson Creek (Ecstall Mining/Cathedral Gold)	104B 131	Liard	104B/10W	Au, Ag, Pb Zn, Cu	Vein	26 ddh, 3245 m; soil geochem; UTEM; airborne mag, EM
20	Inel (Inel Resources)	104B 113	Liard	104B/10W	Au, Ag, Cu Pb, Zn	Vein	ddh, 7112 m surface; 1487 m u/g; 131 m drifting; VLF; mag; UTEM; mapping
21	Eskay Creek (Calpine Resources Cons., Stikine Silver/Prime Explorations)	104B 008	Skeena	104B/09W	Au, Ag	Epithermal? massive sulphide	180 ddh, 11 278 m; mapping; VLF; IP; mag; airborne geophysics; soil geochem
22	Sib (American Fibre)		Skeena	104B/09W	Au, Ag, Pb Zn, Cu	Epithermal vein	13 ddh, 1830 m; geochem; IP; airborne geophysics
23	Goldwedge (Catear Resources)	104B 105	Skeena	104B/08E	Ag, Au	Vein	27 m drifting
24	Sulphurets (Granduc Mines/ Newhawk Gold Mines)	104B 193	Skeena	104B/08E	Ag, Au	Vein	79 ddh, 4094 m surface; 10 090 m u/g; 287 m drifting; 1061 m decline; 234 m raising; surface mapping; 408 m rocksaw trenching
25	Kerr (Placer Dome acquisition from/ Western Canadian Mining)	104B 191	Skeena	104B/08	Cu, Au	Porphyry	20 ddh, 4365 m; IP; mapping
26	Treaty Creek (Teuton Resources/ Orequest Consultants)	104B 078	Skeena	104B/09	Au, Ag	Vein	11 ddh, 1183 m; airborne mag, EM; silt, soil, rock; geochem
27	Korri-Hill (Hi Ho) (J.B. Hill)	104B 140	Skeena	104B/01E	Ag, Pb,Au Cu, Zn	Vein	Headframe and hoist installed
28	Big Missouri (Premier Gold Joint Venture/ Westmin Mines)	104B 046	Skeena	104B/01	Ag, Au	Vein	15 ddh, 1758 m
29	Silver Butte (Tenajon Resources)	104B 150	Skeena	104B/01	Ag, Au	Vein	13 ddh, 1329 m u/g; 90 m drifting; 15 ddh, 2827 msurface; soil geochem; trenching; mapping
30	Indian (Caltech Data/Westmin Mines)	104B 031	Skeena	104B/01	Ag, Au, Pb Zn	Vein	17 ddh, 1593 m
31	Silbak Premier (Premier Gold Joint Venture/Westmin Mines	104B 054	Skeena	104B/01E	Ag, Au, Pb Zn, Cu	Vein	44 ddh, 3390 m

32	Red Mountain (Bond Gold Canada)		Skeena	103P/14W	Au, Ag		27 ddh, 4730 m; mapping; trenching; airborne geophysics
33	Willoughby Creek (Bond Gold Canada)		Skeena	103P/14E	Au, Ag		14 ddh, 1709 m; airborne geophysics
34	Homestake (Caulfield Resources, On Wah Resources, NDU Resources/ Noranda Exploration)	103P 216	Skeena	103P/13E	Au, Ag, Cu	Vein	2 ddh, 1450 m; rock and soil geochem; mag; IP
35	Georgia River (Cannon Resources/Avatar Resources)	103O 013	Skeena	103O/16W	Au, Ag, Pb Zn, Cu	Vein	8 ddh, 1525 m
36	Kits (Oliver Gold, Aber Resources/ Keewatin Engineering)	103P 245	Skeena	103P/14W	Ag, Pb, Zn Zn, Cu	Stratiform? massive sulphide,	5 ddh, 1000 m; silt, soil, rock geochem
37	Red Point (Dolly Varden Minerals)	103P 196	Skeena	103P/12E	Ag, Au, Cu Pb, Zn		25 ddh, 2260 m; soil geochem; mapping; trenching
38	North Star (Dolly Varden Minerals)	103P 189	Skeena	103P/12W	Ag, Au, Cu Pb, Zn	Massive sulphide	6 ddh, 2400 m; mapping
39	Illiance River (Monarch) (Great Northwest Resources)	103P 015	Skeena	103P/11E	Ag, Cu, Pb	Vein Zn	7 ddh, 685 m
40	Dick, Kit (Longreach Resources/ J. Paul Stevenson)	103I 215	Skeena	103I/14E	Au, Ag, Cu	Vein	3 ddh, 200 m
41	Lucky B (C. Watson)	103I 136	Skeena	103I/09W	Au, Ag, Cu W, Pb, Zn	Vein	46 m u/g rehabilitation; soil geochem
42	Porcher Island (Cathedral Gold)	103J 017	Skeena	103J/02E	Au, Ag, Cu	Vein	110 m raising; 100 m sub level drifting
43	Trinity-Gren (Fair Harbour Mining)	103H 066	Skeena	103H/12W	Cu, Zn, Pb Ag, Au	Massive sulphide	6 ddh, 450 m
44	Laredo Limestone	103A 001	Skeena	103A/11E	Limestone		11 ddh, 305 m; chip sampling
45	Moosehorn (Cassidy Resources, Imperial Metals/Cyprus Gold)	094E 086	Omineca	094E/06E	Ag, Au, Pb Zn, Ba	Epithermal	6 ddh, 745 m; mag
46	Lawyers (Cheni) (Cheni Gold Mines)	094E 066	Omineca	094E/06E	Ag, Au	Epithermal	100 m drifting; 915 m u/g drilling
47	Shasta (Homestake Mining (Canada)/ International Shasta Resources)	094E 050	Omineca	094E/02	Au, Ag	Epithermal	64 ddh, 5985 m; trenching
48	Grace (Asitka Resources/ Skylark Resources)		Omineca	094E/02	Au, Ag	Epithermal	92 pdh, 1975 m; geochem; prospecting
49	New Kemess (El Condor Resources/ D. Copeland)		Omineca	094E/02	Au, Cu	Porphyry	5 ddh, 782 m; IP; mag; VLF-EM; trenching; soil geochem; mapping
50	Mess (Western Premium Resources/Inco)		Omineca	094E/02E	Ag, Pb, Cu		7 ddh, 366 m
51	Usk (W.H. McRae, F. Loutitt/Falcon Drilling)	103I 183	Omineca	103I/09W	Cu		drilled

52	Morningstar (C. Carlson, J. Leblanc/ Equity Silver Mines)	103P 034	Omineca	103P/01E	Au, Ag, Pb Zn, As	Vein	4 ddh, 543 m
53	Rocher Déboulé (Canamin Resources/Southern Gold Resources)	093M 071	Omineca	093M/04E	Cu, Au, Ag	Vein	u/g rehabilitation; trenching
54	Hearne Hill (D. Chapman, P. Bland/ Noranda Exploration)		Omineca	093M/01E	Cu	Porphyry	6 ddh, 500 m; trenching; road; geochem
55	Bell mine (Noranda Minerals)	093M 001	Omineca	093M/01E	Cu, Au, Ag	Porphyry	ddh, 16460 m
56	Fireweed (Canadian-United Minerals)	093M 151	Omineca	093M/01W	Ag, Pb, Zn	Replacement? conformable mass. sulphide?	28 ddh, 5486 m; IP
57	Dome Mountain (Canadian-United Minerals/ Teeshin Resources)	093L 022	Omineca	093L/10, 15E	Au, Ag, Pb Zn	Vein	20 ddh; trenching; IP
58	Louise Lake (L. Warren, E. Shaede/Corona)	093L 079	Omineca	093L/13E	Cu, Mo, Au	Porphyry	5 ddh, 916 m
59	Telkwa Coal (Shell Canada/Crows Nest Resources)	093L 152	Omineca	093L/11E	coal		18 rcd, 1486 m; 13 ddh, 1020 m; 4 (15 cm) ddh 262 m; resistivity
60	HD (J. Moll, D. & G. Merkley/ Equity Silver Mines)	093L 203	Omineca	093L/07E	Zn, Pb, Cu Ag, Au	Vein	6 ddh, 776 m
61	Bob Creek (Royal Star Resources/ Noramco Explorations)	093L 009	Omineca	093L/07	Au, Ag, Zn	Transitional	8 ddh, 1981 m; IP; mapping
62	Silver Queen (Pacific Houston Resources)	093L 002	Omineca	093L/02	Ag, Au, Pb Zn, Ga, Ge	Vein	945 m u/g ddh; 107 m drifting; surface mapping
63	Hagas (Progold Resources)	093L 221	Omineca	093L/03E	Cu, Ag, Pb Zn		4 ddh, 950 m
64	Hill (Swift Minerals)		Omineca	093E/14	Cu, Au Porphyry		drilling in progress
65	Ox (International Damascus/Granges)	093E 101	Omineca	093/11E	Ag, Pb, Zn	Shear, vein	8 ddh, 750 m
66	Wing (Equity Silver Mines)		Omineca	093E/11	Ag, Au		6 ddh, 485 m
67	Kate (Equity Silver Mines)		Omineca	093E/11	Ag, Au		4 ddh, 458 m
68	Deerhorn (Lindquist Lake) (Golden Knight Resources/ Teck Explorations)	093E 020	Omineca	093E/06W	Au, Ag, Cu W	Vein	2253 m surface ddh; u/g rehabilitation mapping; geochem; mag
SOUTHWESTERN DISTRICT							
74	Valentine Mountain/Blaze (Beau Pré Explorations/ Noranda Exploration)	092B 108	Victoria	92B/12W	Au	Veins	5 ddh; mapping; geophys; geochem; trenching

75	Mount Sicker/Lenora, Tyee, Richard III, Copper Canyon (Minnova, Wind River Resources/Minnova)	092B 001, 2, 3, 4, 86, 89, 99	Victoria	92B/13E, 13W	Au, Ag, Cu, Pb, Zn	Volcanogenic massive sulphide	16 ddh, 3148 m; mapping
76	Lara/Coronation (Laramide Resources/ Minnova)	092B 110	Victoria	92B/13W	Au, Ag, Zn, Cu, Pb	Volcanogenic massive sulphide	44 ddh, 4253 m; geophys; mapping
77	Chemainus/Anita, Pauper (Falconbridge)	092B 037, 40	Victoria	92B/13W 92C/16E	Au, Ag, Zn, Cu, Pb	Volcanogenic massive sulphide	33 ddh, 11 500 m; geophys; geochem; mapping
78	Debbie, Yellow/Regina, Victoria (Westmin Mines, Nexus Resource)	092F 078, 79	Alberni	92F/2E 92F/7E	Au, Ag	Altered shear zone, auriferous chert, quartz vein stockwork	u/g drifting and sampling; trenching; u/g drilling, 13 ddh, approx. 5500 m; surface drilling, 20 ddh, approx. 1365 m
79	Lucky/Red Rover (Electrum Resource/ Freemont Gold)	092F 034	Alberni	92F/3W	Au	Vein	6 ddh, 914 m
80	Catface/ Irishman Creek (Falconbridge)	092F 120, 251	Alberni	92F/4W, 5W	Cu, Mo	Porphyry	4 ddh, 1625 m; u/g sampling; airborne & ground geophys; mapping
81	Ursus Creek/Thunderbird (Pacific Sentinel/Prime Resource Group)	092F 067	Alberni	92F/5E	Au	Shear zone, veins	5 ddh, 792.5 m
82	Cotter Creek (S. Craig/Stoney Creek Mines)		Alberni	92F/5W	Au, Ag	Veins	7 ddh
83	Abco/Mary McQuilton (S. Craig/Gold Parl Resources)	092F 122	Alberni	92F/5W	Au, Ag	Veins	2 ddh; geophys; geochem
84	Spud Valley/Goldfield (McAdam Resources)	092L 211	Alberni	92L/2W	Au, Ag	Veins	u/g drifting and sampling; bulk sampling; test milling
85	Central Zeballos (New Impact Resources/ CanAlaska Resources)	092L 212	Alberni	92L/2W	Au, Ag	Vein	u/g drilling, 21 ddh, 2195 m
86	Hiller-Churchill (Falconbridge/Footwall Explorations)	092L 031, 127, 154	Alberni	92L/2W	Au, Ag, Cu	Skarn, veins magnetite	u/g drilling, 16 ddh
87	CIH (B. Buskell)	092F 323	Nanaimo	92F/7W	Au, As	Vein stockwork in dike	2 ddh, 108 m
88	Angel (Rhyolite Resources/ Nexus Resource)	092F 327	Nanaimo	92F/9E	Au	Veins in altered shear zone	5 ddh, 540 m; geophys; geochem
89	Vananda Gold/Little Billie, Cornell, Copper Queen, Texada Iron (Vananda Gold/Freeport-McMoRan Gold)	092F 105, 106, 107, 112 257, 259	Nanaimo	92F/10E, 15E	Au, Ag, Cu, Zn	Skarn Magnetite	2 2 ddh, 5208 m; geophys; geochem; mapping
90	North Texada/Paris, Loyal (Rhyolite Resources/ Echo Bay Mines)	092F 265, 266	Nanaimo	92F/15E	Au, Ag, Cu, Zn	Skarn	9 ddh, 248 8 m; trenching geophys; geochem; mapping
91	Mount Washington/ Domineer, Lakeview (Better Resources)	092F 116, 117, 330	Nanaimo	92F/11E,11W 92F/14E,14W	Au, Ag, Cu	Epithermal veins, breccias	17 ddh, 571.8 m; trenching
92	Murex (Better Resources/Noranda Exploration)	092F 206	Nanaimo	92F/11E,11W	Au, Ag, Cu 92F/14E,14W	Mineralized breccia	2 ddh, 80 m; rock & soil geochem

93	Dove (J. Paquet/Westmin Mines, Visible Gold)		Nanaimo	92F/11E 14E, W	Cu, Ag, Au, As	Epithermal veins	5 ddh, approx. 610 m; geochem; prospecting
94	Merry Widow/Raven, Kingfisher, Marten, Snowline (Taywin Resources)	092L 044, 45, 46, 50, 51	Nanaimo	92L/6E, 6W	Au, Ag, Co, Cu, magnetite	Skarn, manto	43 ddh, 271 3 m; trenching; geophys
95	Quatse Lake/Caledonia (Hisway Resources)	092L 061, 209	Nanaimo	92L/12E	Cu, Zn, Ag	Skarn	1 ddh, 153 m; trenching
96	HPH/HPH, Ucan, Rain (Hisway Resources)	092L 069, 76, 241, 242 243, 253	Nanaimo	92L/12W	Ag, Pb, Zn, Au, Cu	Skarn, manto	6 ddh, 506 m; trenching; geophys; geochem; mill tests
97	Expo/Hep, Expo, Bowerman (BHP-Utah Mines/ Moraga Resources)	092L 078, 131, 240	Nanaimo	92L/12W	Cu, Mo, Au	Porphyry	7 ddh, 764.4 m; geochem; mapping
98	Lang Bay (Fargo Resources, Brenda Mines)	092F 137	Vancouver	92F/16W	Kaolin, Ge, Ga	Residual sedimentary	12 ddh; process & ma:keting studies
99	Fleck-Britannia/ Victoria (Minnova)	092GNW003	Vancouver	92G/10W, 11E	Cu, Zn, Pb, Ag,Au	Volcanogenic massive sulphides	10 ddh, 2372 m
100	International Maggie/ Indian River Copper, ABC, War Eagle (Minnova Inc)	092GNW024, 28, 42,	Vancouver	92G/10W, 11E	Cu, Zn, Pb, Au, Ag	Volcanogenic massive sulphides	7 ddh, 2345 m
101	Easy & Jo/Mayflower (Hillside Energy, Corona/ Kali Venture)	092GNE010	New Westminster	92G/16W	Au, Ag, Pb, Zn	Shear zone	5 ddh, approx. 400 m; trenching; geochem; mapping
102	Giant Copper/AM (Bethlehem Resources)	092HSW001	New Westminster	92H/3E	Cu, Au, Ag, Mo	Mineralized breccias	23 rdh, 2544 m; trenching; mapping; geochem
103	Mount Foley/Lucky Four (McNellen Resources)	092HSW007, 079	New Westminster	92H/4E	Cu, Ag, Au, Mo	Skarn	29 u/g ddh, 1519 m
104	Ladner Creek/Aurum, Idaho, Montana, Pipestem (Anglo Swiss Mining)	092HNW003, 7, 8, 9, 11, 48	New Westminster	92H/11W	Au, Ag	Veins	12 u/g ddh, 610.5 m; 6 ddh, 417 m; mapping
105	Wren (J. MacDonald/ Castle Minerals)		Lillooet	92J/6E, 7W	Au	Altered shear zone; veins	5 ddh, 202 m; geochem; geophys; mapping; trenching
106	Cimadoro (Doromin Resources/Teck Explorations)		Skeena	103F/1E, 1W	Au, Ag, Cu, Zn	Massive sulphides	6 ddh, approx.1000 m; geophys; geochem; mapping
107	Cinola (City Resources Canada/ Barrack Mine Management)	103F 034	Skeena	103F/9E	Au, Ag	Epithermal veins; breccia	3 ddh, 320 m; metallurgical testing; feasibility study

SOUTH CENTRAL DISTRICT

111	Victory (Minnova)		Kamloops	82M/4W	Ag, Au, Cu, Zn,Pb	Massive sulphide	7 ddh, 950 m, geochem
112	OK (Minnova)		Kamloops	82M/4W	Au, Ag, Cu Zn, Pb	Massive sulphide	3 ddh, 12 99 m
113	Dixie (Minnova)		Kamloops	82M/4W	Ag, Au, Cu, Zn, Pb	Massive sulphide	2 ddh, 200 m, geochem; geophys, 25 km

114	Kamad (Homestake Mineral Development)	082M 025	Kamloops	82M/4W	Zn, Cu, Ba, Au, Ag	Massive sulphide	25 ddh, 1515 m; 15 trenches; geophys, 21 km
115	Cana (Mingold Exploration/ Homestake Mineral Development)		Kamloops	82M/4W	Au, Ag, Cu Zn, Pb	Massive sulphide	2 ddh, 300 m;
116	Twin Mountain (Homestake Mineral Development)	082M 020	Kamloops	82M/4W	Au, Ag, Cu Zn, Pb	Massive sulphide	3 trenches, 200 m
117	Bay (Cominco/Falconbridge)	082M 053	Kamloops	82M/4E	Au, Ag, Zn, Cu, Pb	Massive sulphide	9 ddh, 1333 m; geophys; road
118	FY 1-3, Anna (Bar) (Minnova)		Kamloops	82M/5W	Ag, Au, Cu, Pb, Zn	Massive sulphide	5 ddh, 530 m; geochem geophys, 87 km
119	Biere (National Resource Exploration/ Minnova)	082M 069	Kamloops	82M/5W	Au, Ag, Cu, Zn, Pb	Massive sulphide	5 ddh, 5 m; geophys, 3.9 km
120	CM (Chinook Mountain) (BP Minerals/Minnova)	092P 101	Kamloops	92P/8E	Au, Ag, Cu Zn, Pb	Massive sulphide	5 ddh, 585 m; geochem; geophys, 100 km
121	Chu Chua (Pacific Cassiar/Minnova Inc.)	092P 140	Kamloops	92P/8E	Cu, Au	Massive sulphide	21 ddh, 1663 m; geochem geophys, 25 km
122	Epi/Yard (Inco Gold Mgmt.)	092P 127	Clinton	92P/2W	Au	Epithermal	20 ddh, 3913 m; 4 km, road
123	Bonaparte (Centre) (Interpacific Resources/ QPX Minerals	092P 159	Kamloops	92I/16W	Au	Vein	9 ddh, 449.3 m
124	Arrowstone (MOW) (M. Dickens/Iron River Resources)		Kamloops	92P/2W	Au	Epithermal	5 ddh, 199 m; geochem; geophys
125	Rayfield (P. Ziebart/Brenda Mines)	092P 005	Clinton	92P/6E	Cu, Au	Porphyry	8 ddh, 1100 m; geophys, 36 km
126	Haida (Electrum Resources/ Teck Explorations)	092P 136	Kamloops	92P/9W	Au, Ag	Skarn	10 trenches, 1 km; geochem, 1500 samples
127	G claims (G. Wolanski/Michael Resources)		Kamloops	92P/1E	Feldspar	Intrusive	13 ddh, 582 m; trenching bulk sample
128	Iron Mask (North Eureka Resources/ Teck Explorations)	092INE031	Kamloops	92I/15E, 10E	Cu, Au	Porphyry	19 ddh, 1818 m
129	Morgan (Shepherd Insurance Group/R. Steiner)	092INE110	Kamloops	92I/16E	Ag, Cu, Au	Vein	4 ddh, 183 m; geochem; geophys
130	Maskam (Beaton) (V. Coucet/Boitard)		Kamloops	92I/10E	Cu, Au	Porphyry	3 ddh, 972 m; geochem; geophys, 20 km
131	Boy (Skyrocket Exploration and Resources)		Kamloops	92I/10E	Cu, Au	Porphyry	4 ddh, 1356 m
132	Model-Anne (Mad River Resources)	092INE039	Kamloops	92I/10W	Au, Ag	Vein	7 pcdh, 733 m; geophys, 15 km
133	Oz (J. Osterhagen/Brenda Mines)		Kamloops	92I/9W	Cu, Au	Porphyry	11 pcdh, 1006 m; geophys, 60 km
134	Edith (Cominco)	092INE101	Kamloops	92I/9W	Cu, Au	Porphyry	41 pcdh, 3507 m
135	Road (A. Babiy/Naxos Resources)		Kamloops	92I/9E	Au	Vein	18 ddh, 1700 m; 8 pcdh, 500 m; geochem,
136	JJ (J. John/Naxos Resources)		Kamloops	92I/9W	Cu, Au	Vein	4 ddh, 80 m; geochem;
137	Vicars (L. Mear/A. Babiy)	092INE169	Kamloops	92I/9E	Cu, Au	Vein	1 ddh, 75 m; geochem

138	Powl (L. Mear/A. Babiy)		Kamloops	92I/8E, 9E	Cu, Au	Vein	1 ddh, 70 m; geochem
139	Mary Reynolds (Anglo American Resources)	092ISE115	Nicola	92I/8W	Au	Vein	6 ddh, 596 m; geophys
140	Des (C. Boitard/Menika Mining)		Kamloops	92I/7E	Cu, Au	Porphyry	7 ddh, 2046 m
141	Leadville Charmer (K. Livingstone/ Golden Dynasty Resources)	092ISE052	Nicola	92I/2W	Au	Vein	4 ddh, 456 m; geochem; geophys
142	Brett (Corona)	082LSW110	Vernon	82L/4E	Au	Epithermal	29 ddh, 4486 m, trenching; geochem
143	Miller (Eureka Resources)		Vernon	82L/4E	Au	Epithermal	2 ddh, 475 m; geophys, 8 km
144	CLF/Exam (Clifton Resources/ Spencer Engineering)		Nicola	82L/4W, 5W	Au	Vein	2 ddh, 124 m; geochem; geophys, 8 trenches, road
145	Jewel (Corona)		Kamloops	82L/5E, 12E	Au, Cu	Shear vein	9 ddh, 839 m; geochem; geophys
146	Lavington (BP Resources Canada)		Vernon	82L/6E	Au	Vein	5 ddh, 610 m; geochem, geophys
147	BS (Zicton Gold)		Vernon	82L/7W	Au	Shear	1 ddh, 209 m vein
148	OK (Lumby) (Zedco Petroleums/J. Hilton)		Vernon	82L/7W	Au	Vein	1 ddh, 61 m; trenching
149	Vault (7 Mile High Group/Inco Gold Mgmt)	082ESW173	Osoyoos	82E/5E	Au	Epithermal	75 ddh, 13 229 m
150	Dusty Mac (Dusty Mac Mines/Minnova Inc.)	082ESW078	Osoyoos	82E/5E	Au	Epithermal	13 ddh, 3244 m; geochem, geophys, 125 km
151	Allendale (Allendale Resources *et al.*/ Yukon Minerals)	082ESW060	Osoyoos	82E/6W	Cu, Au	Porphyry	4 ddh, 248 m geochem, geophys
152	Au (K. Daughtry/Inco Gold Mgmt)		Osoyoos	82E/6W	Au	Epithermal	8 ddh, 1637 m; geochem
153	Venner (Corona/Tigris Minerals)		Osoyoos	82E/6W	Au	Epithermal	1 ddh, 410 m
154	Cariboo-Amelia (W. McArthur/Ark Energy/Gold Power)	082ESW020	Greenwood	82E/3E	Au	Vein	12 ddh, 872 m; 3 trenches, 122
155	Jolly (Brican Resources/Minnova)	082ESW159	Osoyoos	82E/3E	Au	Vein	9 ddh, 1299 m; geochem; geophys, 18 km
156	LMS (F. Lalonde/Huntington Resources)		Osoyoos	82E/3W	Au, Ag	Vein	2 ddh, 237 m
157	Beaverdell (Del Norte Chrome)	082ESW031	Greenwood	82E/6E	Ag, Au	Vein	15 ddh, 1265 m
158	Dominion (Mad River Resources)	082ESW071	Greenwood	82E/6E	Au, Ag	Vein	8 pcdh, 701 m
159	Dividend-Lakeview (Rideau Resources/Battle Mountain (Canada)	082ESW001	Osoyoos	82E/3W, 4E	Au	Skarn	5 ddh, 777 m; geochem; geophys
160	Astro (QPX Minerals/ Minequest Expln. Associates)		Osoyoos	82E/5W	Au	Vein	5 pcdh, 248 m; trenching, 150 m
161	Vent (Zygote Resources)	082ENW071	Osoyoos	82E/12W	Au	Epithermal	8 pcdh, 492 m

162	Crystal Peak (Mt. Riordan) (Polestar Exploration Inc.)	082ESW107	Osoyoos	82E/5W	Industrial garnet	Skarn	23 ddh, 1011 m; geophys, road
163	Nickel Plate (Corona)	092HSE062	Osoyoos	92H/8E	Au	Skarn	2 ddh
164	John, Taurus (Nickel Plate) (K D'Angelo/Corona)		Osoyoos	82E/5W	Au	Skarn	6 ddh, 568.3 m
165	Rollo, Climax (Nickel Plate) (Corona)	092HSE049	Osoyoos	92H/8E	Au	Skarn	4 ddh, 1932 m
166	Canty, Good Hope, French (Golden North Resource/Corona)	092HSE064	Osoyoos	92H/8E	Au	Skarn	57 ddh, 6053 m; geochem
167	Pridge, Evening Star, Bullion (Hedley Pacific/Corona)		Osoyoos	92H/8E	Au	Skarn	11 ddh, 1706 m
168	Eagle's Nest (Agio Resource/ Corona)	092HSE036	Osoyoos	92H/8E	Au	Skarn	3 ddh, 408 m u/g
169	Golden Zone (Midland Energy Group/ Redding Gold)	082ESW042	Osoyoos	82E/5W	Au	Vein	4 ddh, 282 m; 3 trenches; geochem
170	Elk (Fairfield Minerals/Placer Dome)		Similkameen	92H/16W	Au	Epithermal	12 ddh, 754 m; 17 trenches; 2000 m; geochem, geophys, 50 km
171	Dill (Fairfield Minerals)		Similkameen	92H/9W, 16W	Au	Vein	12 trenches, 200 m; geochem, geophys, 6.3 km
172	Spring (Golden Pick Resources/ Placer Dome)	092HNE108	Similkameen	92H/16W	Au	Shear vein	20 trenches, 1200 m; geochem; geophys, 95 km
173	Gold Core (H. Adams)		Similkameen	92H/9W, 16W	Au	Vein	2 ddh, 152 m
174	Lost Horse Gulch (Similco Mines)	092HSE001	Similkameen	92H/7E	Cu, Au	Porphyry	ddh; geophys, 40 km; geol
175	Oriole (Similco Mines)	092HNE024	Similkameen	92H/7E	Cu, Au	Porphyry	6 ddh, 800 m; geochem, geophys, 40 km
176	Tor (E. Wedekind)		Similkameen	92H/10E	Au, Cu	Vein	5 pcdh, 305 m; 5 ddh, 305 m; geochem
177	Lodestone (Imperial Metals/ Tiffany Resources)	092HSE034	Similkameen	92H/7W	Fe, Au, PGE	Magmatic	6 ddh, 613 m; geochem, road
178	Treasure Mountain (Huldra Silver)	092HSW016	Similkameen	92H/6E	Ag,Pb,Zn	Vein	13 ddh, 1227 m; 10 pcdh, 575 m; geochem, 570 samples, geophys, 4.6 km
179	Keystone (Blue Gold Resources)	92HNW024	Nicola	92H/11E	Au, Ag	Intrusive breccia	4 ddh, 404.4 m
180	Spokane (J. Posnikoff/MacNeill Industrial)	92JNE 034	Lillooet	92J/16W	Au, Ag	Vein	37 ddh, 1586 m; 21 trenches, 420 m; geophys, 8.3 km, road
181	Cub 200 (MacNeill Industrial)		Lillooet	92J/16W	Cu, Mo	Porphyry	3 ddh, 547 m; geochem
182	Second (Cyprus Gold Canada)		Clinton	920/1E	Au	Vein	13 ddh, 1838 m; trenching, geochem; geophys
183	Minto Extension (Avino Mines & Resources)	092JNE075	Lillooet	92J/15W	Au	Vein	5 ddh, 610 m
184	Gun Creek (Mt. Allard Resources/ Hi-Tec Resource Management)		Lillooet	92J/15W	Au, Ag	Vein	3 ddh, 194 m; geochem
185	Love Oil/Cosmopolitan (Coral Gold)		Lillooet	92J/15W	Au, Ag	Vein	7 ddh, 914.4 m; 70 trenches, 1524 m

186	J & L (Pan American Minerals/ Equinox Resources)	082M 003	Revelstoke	82M/8E	Au, Zn, Pb, Ag	Sedex	32 ddh, 3000 m; bulk sample
187	Goldstream (Bethlehem Resources)	082M 141	Revelstoke	82M/9W	Cu, Zn	Massive sulphide(Besshi)	6 ddh, 255 m; geochem, 1476 samples u/g
188	Keystone (J. Leask/Bethlehem Resources)	082M 088	Revelstoke	82M/8W	Cu, Zn, Pb, Au, Ag	Massive sulphide	11 ddh, 1555 m
KOOTENAY DISTRICT							
196	Rossland Claims (Bryndon Vent./Antelope Res.)		Trail Creek	82F/4W	Au	Vein	55 ddh, 8455 m; geophys
197	Velvet (Minnova)	082FSW162	Trail Creek	82F/4	Au	Vein	3 ddh, 750 m
198	Tillicum Mtn. (Esperanza Explorations)	082FNW234	Slocan	82F/13	Au, Ag	Quartz skarn	Grizzly, 4 ddh, 600 m; East Ridge, 10 ddh Arnie Flats, 5 ddh, 300 m
199	Millie Mack (Bapty Research Ltd.)	082KSW051	Slocan	82K/4	Ag, Au, Pb	Shear	66 holes (3000 m pdh 175 m ddh); 100 trenches
200	Duncan Lake (Cominco)	082KSE023	Slocan	82K/7	Pb, Zn	Replacement	2 ddh, 1524 m
201	Red Elephant (Mikado Resources/Roper Resources)	082KNW056	Slocan	82K/11E	Au, Cu		48 ddh, 2750 m
202	Second Relief (Hawkeye Dev.)	082FSW187	Nelson	82F/6W	Au	Skarn	6 ddh & more; geophys; geochem
203	Great Western Star (Lectus Dev./Pacific Sentinel Gold)	082FSW083	Nelson	82F/6W	Au, Ag	Porphyry?	Trenching, drilling planned
204	Whitewater Group (Snowwater Resources)	082FSW222	Nelson	82F	Au	Vein, breccia?	15 (ddh & rdh)
205	Rely (Pegasus Gold)		Nelson	82F/3	Au, Zn		4 ddh, 850 m; geophys
206	Alpine Gold (Cove Resources)	082FNW127	Nelson	82F/11	Au	Vein	12 ddh; underground sampling
207	Sumit (Baloil Resources)	082FSW054	Nelson	82F/3	Au	Vein	10 ddh(?), 700 m;), trenching geophys
208	Liz, John, Bid, Rex, Tag (Legion Resources)	082FSE005	Nelson	82F/2	Zn	Stratabound	7 ddh
209	Star (Cominco)	082ESE089	Nelson	82F/1W	Ag, Pb, Zn	Sedex	1 ddh
210	For Sure (King Jack Resources)		Nelson	82F/11	Au	Breccia	4 ddh
211	Katie (Baloil Resources)		Nelson	82F/3	Cu, Au	Porphry	3 ddh, 300 m
212	Nugget (Gunsteel Resources)	082FSW040	Nelson	82F/3E	Au, Ag, Pb	Vein	Fawn x-cut extended, financing mill
213	Kenville Mine (Algoma Industries)	082FSW086	Nelson	82F/6W	Au	Vein	Mill tests

214	Vine (Cominco/Kokanee Exploration)	082GSW035	Fort Steele	82G/5W	Pb, Zn,Cu	Vein	trenching, 10 ddh, 1250 m
215	Howell 1-5, Howe 1-7 Cominco/Placer Dome		Fort Steele	82G/2	Au	Alkaline porphyry	7 ddh, 1095 m
216	Flathead Cominco/Placer Dome	082GSE026	Fort Steele	82G/2	Au	Alkaline porphyry	6 ddh, 866 m
217	Goatfell (Chevron Minerals)		Fort Steele	82F/1	Pb, Zn	Sedex, breccia	2 ddh, 1161 m; geochem
218	McNeil (Dragoon Resources)		Fort Steele	82G/5W	Pb, Zn	Sedex	7 ddh , 1250 m & 6 pending
219	Stoney (Minnova)	082GSW022	Fort Steele	82G/4	Pb, Zn	Sedex	2 ddh , 500 m
220	Domtar Gypsum (Kootenay Geo-Service)		Fort Steele	82J/4	gy	Evaporite	11 rdh, 300 m
221	Denby (Westroc Resources)		Fort Steele	82G/14	gy	Evaporite	New discovery, 3 to 5 million tonnes possible reserves; trenching
222	Reserve (Westroc Resources)		Fort Steele	82G/14	gy	Evaporite	
223	Eagle Mt. (Fording Coal)		Fort Steele		Coal		5 ddh, 2428 m
223	Henrietta Creek (Fording Coal)		Fort Steele		Coal		30 rdh, 2859 m
223	Lake Mt. & Lake Pit (Fording Coal)		Fort Steele		Coal		8 rdh, 855 m, 4 rdh, 374 m
224	North Line Creek (Crows Nest Resources)		Fort Steele		Coal		45 dh, 8000 m
224	Teepee (Crows Nest Resources)		Fort Steele		Coal		1 dh, 150 m
224	Horseshoe Ridge (Crows Nest Resources)		Fort Steele	82G/15W	Coal		ddh, 495 m
224	3 & 4 Seam Area (Crows Nest Resources)		Fort Steele	82G/15	Coal		
224	Ewin Pass (Crows Nest Resources)		Fort Steele	82G/15	Coal		4 dh, 600 m
224	Mine Services Area (Crows Nest Resources)		Fort Steele	82G/15	Coal		12 dh, 1500 m
226	Cougar 6&7 (Greenhills) (Westar Mining)		Fort Steele		Coal		9 ddh, 930 m
233	Golden Crown (Cons. Boundary Exploration/ Altwood Gold)	082ESE032	Greenwood	82E/2E	Au, Ag	Vein	465 m drifting x-cut, raise, 42 ddh, 3230 m winter 88/89

CENTRAL DISTRICT

235	Mt. Milligan/Phi Heidi (Continental Gold)	093N 194	Omineca	93N/1	Au, Cu	Alkali porphyry	406 ddh, 76 200 m; feasibility study
236	Windy (Big Bar Gold/Placer Dome)	093J 024	Cariboo	93J/13	Au	Alkali porphyry	37 ddh, 5500 m; 30 pdh; trenching
237	Tas (Noranda Exploration/ Black Swan Gold Mines)	093K 080	Cariboo	93K/16	Au	Porphyry	9 ddh, 1300 m; IP; trenching

238	Chuchi (Noranda Exploration)	093N 041	Omineca	93N/1, 2	Au, Cu	Alkali porphyry	29 ddh, 2750 m; geophys
239	Chuchi (BP Resources Canada/ Digger Resources)	093N 041	Omineca	93N/1, 2	Au, Cu	Alkali porphyry	9 ddh, 1300 m; geochem; geophys
240	Mt. Bodine (Noranda Exploration)		Omineca	093N/12W	Au, Cu	Porphyry	ddh; geochem; geophys
241	Col (C. Campbell/Kookaburra Gold)	093N 101	Omineca	93N/2E	Au, Cu	Alkali porphyry	geochem; geophys
242	Mitze/Buz (R. Haslinger/Noranda Exploration)	093N 096	Omineca	93N/1W	Au, Cu	Porphyry	geochem
243	Tsil (Noranda Exploration)		Omineca	93K/16E	Au, Cu	Porphyry	5 ddh, 500 m; geochem; geophys
244	Blackhawk (J. Hidber/Noranda Exploration)	093N 022	Omineca	93N/10E	Au	Porphyry related	4 ddh, 320 m
245	Nina Lake (Noranda Exploration)	093N 011	Omineca	93N/15	Au	Replacement?	4 ddh
246	Cat/Betty (BP Resources Canada/ Lysander Gold)	093C 069	Omineca	94C/3	Au, Cu	Porphyry	7 ddh, 910 m; geochem; mag, 7 trenches
247	Quesnel River/QR (QPX Minerals)	093A 040	Cariboo	93A/12	Au	Alkali porphyry	45 ddh, 800 m; geotechnical; MDRP Stage 1
248	Mt Polley/Cariboo Bell (Imperial Metals)	093A 008	Cariboo	93A/12E	Au, Cu	Alkali porphyry	139 ddh, 18 700 m; geotechnical; MDRP pospectus
249	Mouse Moutain (Placer Dome)	093G 003	Cariboo	93G/1	Au, Cu	Porphyry	geochem, geophys
250	Cariboo (Corona)	093H 006	Cariboo	93A/12E	Au, Cu	Porphyry?	10 ddh, 1750 m; geochem
251	Miracle (GWR Resources)	093P 002	Clinton	92P/14W	Au, Cu	Porphyry	trenching, 1500 m
252	Redgold/C2 (J. Morton, R. Durfeld/ Phelphs Dodge Canada)	093A 069	Cariboo	93A/6W	Au, Cu	Porphyry	geochem
253	Frasergold (Eureka Resources)	094A 150	Cariboo	93A/7E	Au	Phillite-hosted	heap leach test planned
254	Cariboo Gold Quartz (Mosquito Consol Gold/Pan Orvana Res.)	093H 019	Cariboo	93H/4E	Au, Ag	Vein	u/g drifting; pdh and ddh
255	Indian Lake (Noranda Exploration)		Cariboo	93H/6	Pb, Zn, Ag	Replacement	10 ddh, 900 m
256	Maybe (R. Keep/Sable Resources)		Cariboo	093A/14	Pb, Zn, Ag	Vein	10 ddh
257	WD (Kennco Exploration/ Comineca)	093H 072	Cariboo	93H/6	Pb, Zn, Ag	Replacement	3 ddh; geochem; geophys
258	Snowbird (Pipawa Exploration/X-Cal Resources)	093K 036	Omineca	93K/7, 8	Au	Vein trenching	20 ddh, 4000 m;
259	Indata (Eastfield Resources)	093N 192	Omineca	93N/6W	Au	Vein	13 ddh; 1795 m; 42 trenches; geochem; IP
260	Swan/Boom (Eastfied Resources/ Northair Mines)	093N 073	Omineca	93N/11W	Au, Cu	Porphyry	geochem; IP

261	Tchentlo Lake (Westmin Mines)		Omineca	93N/2E	Au	Vein	geochem; geophys
262	HC (Noranda Exploration)		Omineca	93G/15W	Au, Ag	Epithermal	pdh, 3000 m; trenching; geochem
263	Hanson Lake (Cazador Explorations)	093K 081	Omineca	93K/6	Au, Cu	Porphyry	30 pdh, 1000 m; geochem; geophys
264	Taseko (Westpine Metals)	092O 038	Clinton	92O/3W	Au, Cu	Porphyry	10 ddh, 2000 m
265	Spokane (Canmark International Resources)	093O 024	Clinton	92O/3W	Au, Cu	Porphyry related	6 ddh, 600 m
266	Fish Lake (Taseko Mines/Cominco)	093O 041	Clinton	92O/5E	Au, Cu	Porphyry	12 ddh, 1984 m; metallurgical tests
267	Perkins Peak (Kleena Kleene Gold Mines/ Hunter Point Expln.)	093N 010	Clinton	92N/14	Au	Epithermal	180 m u/g drifting
268	Cirque (Curragh Mining/ Canadian Mine Development)	094F 008	Omineca	94F/11	Pb, Zn, Ag	Sedex	decline; u/g development; geotech; MDRP prospectus
269	Mt Alcock (Triumph Resources)	094F 015	Omineca	94F/11W	Pb, Zn, Ag	Sedex	9 ddh, 1200 m; geochem; IP
274	Quintette (Quintette Coal)	093P 019	Liard	93P/2W, 3E	Coal	Sedimentary	5 ddh, 56 rdh, 7290 m

NORTHWESTERN DISTRICT

By D.V. Lefebure and M.L. Malott
District Geology, Smithers

INTRODUCTION

In northwestern British Columbia four new gold mines opened in 1989. The Lawyers (Cheni) mine in the Toodoggone went into production late in 1988 and became fully operational in January 1989. A small open-pit mining operation was started on the Shasta property and the ore trucked to the mill at the old Baker mine. In the Stewart area the Premier mine started up in May processing ore from the Big Missouri and Silbak Premier open pits. At the Golden Bear property mining started in the open pit in the summer and underground in the fall. The ore was stockpiled for winter milling. The Johnny Mountain, Bell and Equity Silver mines continued operations throughout the year, however, Cassiar Asbestos Corporation halted open-pit mining at the beginning of June, due to limited asbestos reserves and the possibility of a pit-wall failure. The Erickson mine remained closed; drifting in the adit being driven to access the Michelle zone was stopped roughly 1.1 kilometres short of its target.

Currently under development, the McDame asbestos deposit in Cassiar should start producing asbestos fibre in April or May, 1990. At the end of the year the Sulphurets and Snip projects were at very advanced exploration stages of exploration with production decisions a possibility in 1990.

Exploration activity in the Northwestern District slowed from the record levels of 1987 and 1988, primarily due to difficulties in raising risk capital and falling gold prices. Expenditures for the Northwest were in excess of $61 million for the 68 major exploration projects, down $36 million from 1988. The Stewart - Iskut River gold belt continued to be the busiest exploration and development area in the district, with expenditures in excess of $27 million on 17 major projects, including the Eskay Creek deposit.

Reconnaissance prospecting programs increased throughout the district, particularly in the region extending from north of the Iskut River to the Tatsamenie Lake area. Several companies also showed renewed interest in the Kitsault Valley area. These two areas are underlain by rocks of the Stikine Terrane which also hosts the numerous gold deposits of the Iskut River - Stewart gold belt. Exploration companies examined a broader variety of mineral deposits in 1989 than in previous years, with veins, skarns, porphyries and volcanogenic massive sulphides the most frequent targets.

Coal exploration was limited to only one program on the North zone of the Telkwa property as Crows Nest Resources Limited prepared to submit a Stage 2 report in early 1990. The number of placer mining operations in the district declined 15 per cent from 1988. Queenstake Resources Ltd. produced a total of 377 kilograms of fine gold from two large operations in the Atlin area.

HIGHLIGHTS

- Intense exploration activity continued on the **Windy Craggy deposit** (1) with expenditures of $14.1 million
- Deep drilling on the **Tulsequah Chief property** (4) identified a new sulphide lens and increased ore reserves.
- At **Golden Bear** (71) construction and mine development was completed with open-pit and underground mining starting in the summer and fall, respectively.
- Underground development continued at the **McDame asbestos deposit** (8) with production planned for 1990.
- After 26 years of operation, the **Cassiar Asbestos** open pit (72) halted production in June. Ore stockpiles will feed the mill until the McDame deposit is developed.
- Underground exploration continued at the **Snip project** (17); no production decision has been announced.
- On the **Eskay Creek property** (21) the 21-zone has been traced along a strike length of 1300 metres and down dip 240 metres.
- The **Kerr porphyry copper-gold deposit** (25) reserves were doubled and the property was sold to Placer Dome Inc.
- The West, UTC and newly discovered R-8 Zones continued to be the focus of underground development on the **Sulphurets property** (24).
- Open pit mining started at the **Silbak Premier** (31) and **Big Missouri silver-gold deposits** (28).

FIGURE 3

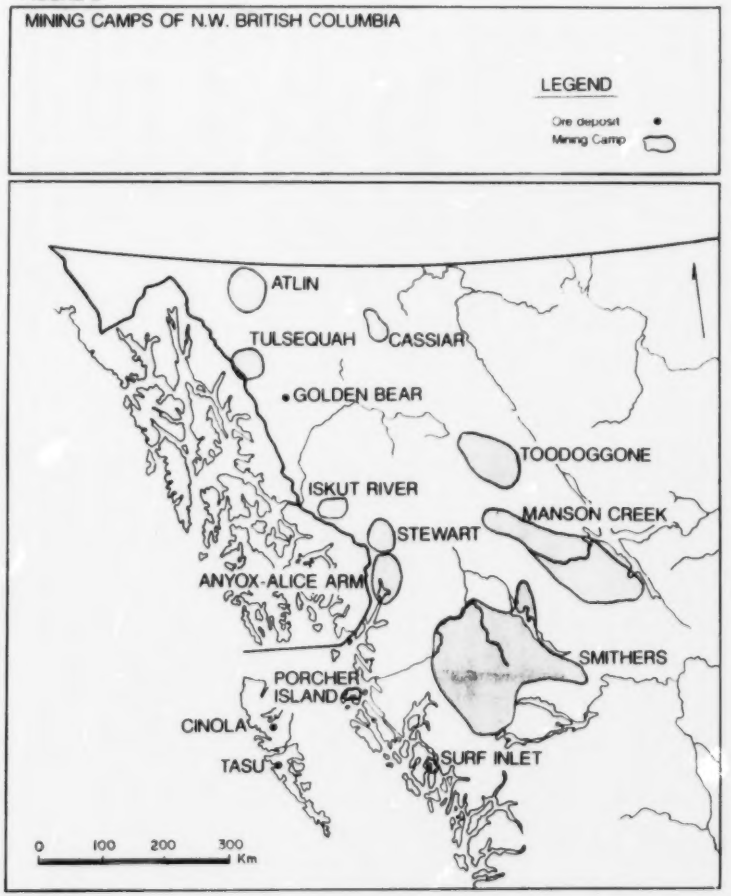
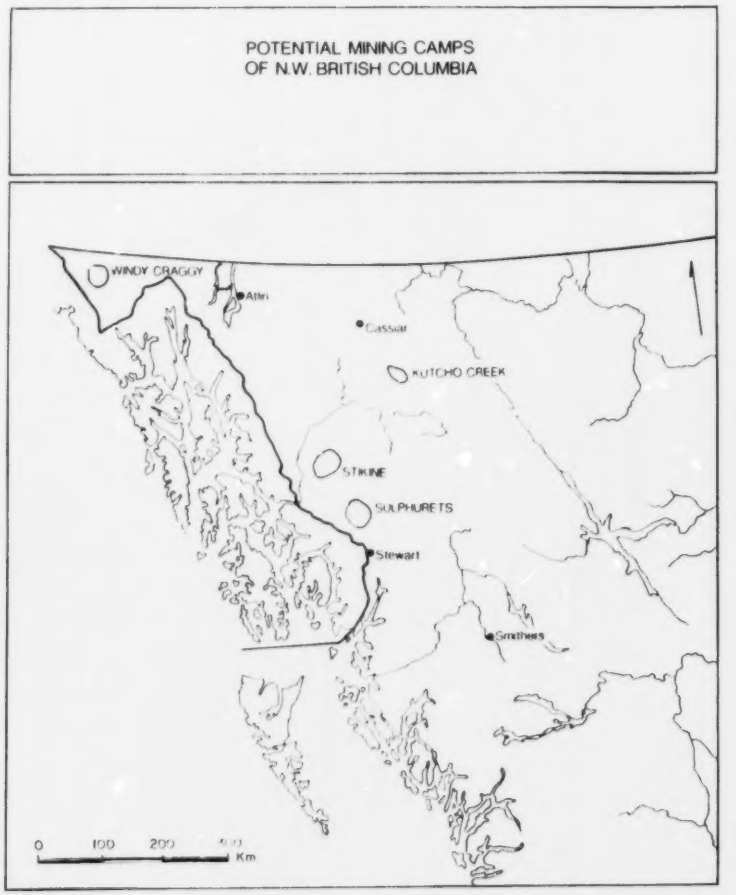


FIGURE 4



- On the **Silver Butte property** (29) underground drilling delineated reserves on the Facecut 35 zone of 105 590 tonnes with cut grades of 10.6 grams gold and 39.7 grams silver per tonne.
- Bond Gold intersected gold mineralization in drilling at **Red Mountain** (32) and **Willoughby Creek** (33).
- The **Lawyers mine** (46) overcame initial start-up problems and the mill operated at the planned 460 tonnes per day.
- Crows Nest Resources Ltd. announced new plans to mine the **Telkwa coal deposit** (59); this time focusing on the North zone.

TRENDS AND OPPORTUNITIES

Exploration activity in the Northwestern District slowed from the record levels of 1987 and 1988, primarily due to difficulties in raising risk capital and falling gold prices. Numerous projects suffered from a late start (July or August) on fieldwork; some companies proposed major exploration programs only to be limited by funding to surface sampling and mapping. Major companies, such as Cominco Ltd., Placer Dome Inc. and Homestake Mineral Development Company, were more active in the Northwestern District.

Exploration expenditures were most significant in known mining camps such as Stewart, Iskut River, Tulsequah, Toodoggone and Smithers (Figure 3) or potential mining camps such as Windy Craggy and Sulphurets areas (Figure 4). However, exploration programs were more widespread than in 1987 or 1988 reflecting a greater willingness to explore on "grass roots" properties. In the region extending from north of the Iskut River to the Tatsamenie Lake area there were a large number of preliminary programs and for the first time in several years, several companies completed major exploration programs in the Kitsault Valley area.

The exciting drill intersections on the Eskay Creek property produced a late summer rush by a number of companies to explore for similar deposits in the general Sulphurets area. Much of the industry activity focused on a mineralized felsic volcaniclastic horizon identified by D. Alldrick and J. Britton of the British Columbia Geological Survey Branch during their mapping in 1988.

Areas with excellent exploration potential are still open for staking throughout the district. Some of the most attractive exploration targets are the porphyry copper-gold deposits within the Stikine Terrane. Examples of known deposits are the Bell orebody on Babine Lake and the Galore Creek deposit located south of Telegraph Creek. The Stikine Terrane north and west of the Bowser Basin is particularly prospective for these deposits. The Babine area also has considerable potential, although in low-lying areas thick overburden increases the difficulty of exploration.

Recent exploration results at Windy Craggy and the Tulsequah Chief mine, as well as the new Greens Creek mine in Alaska, have generated more interest in volcanogenic massive sulphide deposits. There is still considerable open ground in areas with massive sulphide potential including the Tatshenshini River, Cry Lake and Prince Rupert areas (*see* Table 4).

TABLE 4
ADVANCED EXPLORATION PROJECTS, NORTHWESTERN DISTRICT

	Project	Company	Ore Reserves
1	Windy Craggy	Geddes Resources Ltd.	118.8 Mt; 1.9% Cu, 0.08% Co, 0.2 g/t Au, 3.26 g/t Ag
4	Tulsequah	Cominco Ltd., Redfern Resources Ltd.	5.26 Mt; 1.6% Cu, 1.31% Pb, 7.03% Zn, 2.74 g/t Au, 100.5 g/t Ag
9	Erickson Gold	Total Energold Corporation	Erickson: 18.3 kt; 14.1 g/t Au Cusac, Michelle Ext.: 25 kt; 34.29 g/t Au, 12.3 g/t Ag
21	Eskay Creek	Calpine Resources Incorporated, Consolidated Stikine Silver Ltd.	South Zone: 2.5 Mt; 7.47 g/t Au, 101.48 g/t Ag, Pb, Zn, Cu
25	Kerr	Western Canadian Mining Corp., Sulphurets Gold Corporation	114.3 Mt (drill inferred); 0.61% Cu, 0.27 g/t Au, 1.71 g/t Ag
29	Silver Butte	Tenajon Resources Corporation, Westmin Resources Limited	279.4 kt; 17.31 g/t Au 36.68 g/t Ag
	Mt Klappan	Gulf Canada Corporation	231 Mt, anthracite
57	Dome Mountain	Teeshin Resources Ltd. Canadian-United Minerals Inc.	270.9 kt; 12.17 g/t Au 36.68 g/t Ag
59	Telkwa Coal	Shell Canada Ltd.	South Telkwa: 23.4 Mt bituminous coal
62	Silver Queen	Pacific Houston Resources Inc.	1.73 Mt; 327.76 g/t Ag, 6.19% Zn, 2.74 g/t Au, Ge, Cd, In, Ga, Pb, Hg

The North Coast was one of the quietist areas in the province with respect to mineral exploration. This is surprising given the presence of several past producers, including the Surf Inlet and Pugsley gold mines which jointly produced 896 647 tonnes grading 13.4 grams gold and 7.2 grams silver per tonne with 0.32 per cent copper. Gold-bearing mesothermal veins and skarns are prospective targets, particularly if regional structures and known showings are used to pinpoint areas of special interest.

MINERAL EXPLORATION

A total of 441 Notices of Work were submitted in 1989 for mineral exploration, up 53 per cent from 1988. A significant number of these notices were to record program changes from earlier submissions. Expenditures per project varied from small amounts by individual prospectors up to $14.1 million. Table 3 lists the 68 major projects in the Northwestern District with drilling, underground development or major surface exploration programs. The map numbers shown in the Tables and listed in brackets after property names in the following text are keyed to the location map (Figure 2).

TATSHENSHINI RIVER AREA

In the extreme northwestern corner of the province, Geddes Resources Ltd. spent $14.1 million on the Windy Craggy (1) volcanogenic massive sulphide deposit. Extensive underground drifting included a crosscut through the North zone which encountered 223 metres of continuous massive sulphides. Detailed underground drilling increased the confidence level of the ore reserves, currently estimated at 118.1 million tonnes of 1.9 per cent copper and 0.1 per cent cobalt. Ore quality was studied through bulk sampling followed by bench and pilot plant metallurgical tests. Engineering and environmental studies are being completed for a Stage I submission to the British Columbia Mine Development Review Committee. Initial surveying of part of the proposed route for the 105-kilometre access road was completed.

The Rime (East Arm) property (2) of Bond Gold Canada Inc. is located immediately to the east of Windy Craggy. UTEM and magnetic surveys defined an anomaly 2.3 kilometres long which is believed related to massive sulphide mineralization. Drilling through the East Arm glacier in 1988 was followed up in 1989 by drilling from the valley edge.

ATLIN VICINITY

West of Tagish Lake on the Teepee property (3) Cyprus Gold (Canada) Ltd. tested five different vein systems in Proterozoic-Paleozoic metamorphic rocks paralleling and close to the Llewellyn fault. A regional mapping program led by M. Mihalynuk of the British Columbia Geological Survey Branch has identified the Llewellyn fault as a major locus for precious metal mineralization.

In the immediate Atlin area, there was no major exploration activity for Motherlode-style gold deposits, although placer operations are ongoing.

TULSEQUAH RIVER - TATSAMENIE LAKE AREA

Redfern Resources Ltd. announced that Cominco Ltd.'s underground drilling program on the Tulsequah Chief (4) delineated additional reserves bringing the total to 5.3 million tonnes of 1.6 per cent copper, 1.31 per cent lead, 7.03 per cent zinc, 2.74 grams per tonne gold and 100.46 grams per tonne silver. A sulphide lens was discovered down dip from known zones and indications are that the individual upper lenses may be coalescing at depth, into a single large zone open in all directions. Nearby, in a geologically similar setting to the Tulsequah Chief, Sunport Metals Corporation completed a drill program on the brecciated sulphide mineralization of the Banker (6). Across the Tulsequah river on the old Polaris-Taku mine site (5), Suntac Minerals Corporation drilled a number of gold-bearing mesothermal vein systems. In one hole the drilling intersected 8.5 metres (true width) grading 23.5 grams per tonne gold. Results to date suggest gold grades and widths are increasing with depth.

CASSIAR MINING CAMP

At the Erickson gold mine (9), in the Cusac area, the exploration adit being driven to access the Michelle zone was halted in the fall. The adit is 1375 metres long and approximately half-way to its target. Elsewhere on the Cusac option, limited open-pit tonnage was outlined on the Heather vein and the Bain vein was discovered. The latter was traced along strike by drilling for 200 metres with widths of 0.5 to 1.7 metres containing high gold values.

On the McDame property (8) of Cassiar Mining Corporation some drifts were rehabilitated and underground diamond drilling defined further reserves.

North of Cassiar, near the British Columbia - Yukon boundary, Strathcona Mineral Services Ltd. pumped out the workings and rehabilitated the camp at Midway (7) preparatory to a major exploration program in 1990.

DEASE LAKE - MOUNT EDZIZA AREA

On the Gnat Pass property (10) of Integrated Resources Ltd., located immediately southeast of Dease Lake, it is expected that the results of a drilling and trenching program will increase both the known tonnage and grade on this copper porphyry deposit.

To the west of Mount Edziza Park, Integrated Resources drove a number of rotary drill holes into the Barrington River placer lease (11) testing the two gold-bearing pay zones. Close to the eastern boundary of Mount Edziza Park, Cominco Ltd. drilled on the Spectrum property (12). The holes were to test strike length and down-dip extensions of previously drilled high grade gold intersections in an Upper Triassic to Lower Jurassic volcanic-sedimentary sequence which is crosscut by Jurassic to Cretaceous diorite to quartz monzonite dikes. South and east of Mount Edziza Park the Hank claims (13) of Lac Minerals Ltd. cover altered Upper Triassic andesites cut by quartz-carbonate-barite veins. Drilling intersected several-high grade gold and silver sections with associated zinc, lead and copper mineralization.

ISKUT RIVER AREA

The Iskut River area was again a hot spot of activity. Triassic Stuhini or Jurassic Hazelton Group volcanics and sediments were the focus of exploration for gold hosted in veins or shears and associated with quartz, carbonate, sulphides and chlorite.

A study jointly funded by government and industry identified the best route for a future access road to the Bronson Creek airstrip. The cost of building the all-weather industrial road is estimated to be $12.5 million and construction could start as early as spring 1990.

Gulf International Minerals Ltd. concentrated on drilling the Northwestern zone on the McLymont property (14). The mineralization is along a northeast-trending shear and replaces the limy siltstones of a Mississpian sequence of cherts and siltstones. Drilling for an extension of the Northwestern zone, as well as on two adjacent geophysical targets, expanded the potential size of the deposit.

On the Iskut joint venture project (15), drilling by Prime Resources Corporation tested a strong soil geochemical anomaly and coincident weak geophysical trends on an interpreted strike extension of the Gorge showing.

Hughes-Lang Corporation drilled 33 holes testing four sub-parallel zones on the Iskut River property (16). The northwestern portion of the property contains semimassive to massive sulphide mineralization and quartz-carbonate veins within Hazelton Group sediments. Gold values range between 2.81 grams per tonne gold over 2.7 metres, and 44.6 grams per tonne gold over 1.4 metres. A second style of mineralization, a gold-copper-molybdenum porphyry, is found in sericitized, feldspathized and biotized greywacke in the southeast corner of the claims.

Cominco Ltd. spent $2.3 million on an extensive underground drilling and drifting program on the Twin zone at the Snip site (17). The Twin zone is a shear vein averaging 4.3 metres in width cutting greywackes and siltstones. After the completion of 489 holes in 1989 the current reserves are 934 395 tonnes containing 30.0 grams per ton gold. Testing of a bulk sample indicated that average recoveries would be 90 per cent.

At Johnny Mountain (18) Skyline Gold Corporation drilled 19 holes in the Johnny Flats area and concentrated on testing three locations; the Windsock, the C-3 and the Bronson Slope anomalies. Another 109 drill holes were completed in the vicinity of the mine to better define the Pick Axe zone and increase the reserves. Prospecting discovered the Homestake vein, which trends parallel to, and is located to the north of the Discovery vein.

Two mineralized structures on the Bronson Creek property (19), the S and T zones, were drilled by Cathedral Gold Corporation. The claims, underlain by Mesozoic siltstone, sandstone and volcanics, are intruded by granitic stocks and dikes. Hole 89-9 on the S zone cut a 4.6 metre intercept grading of 15.77 grams gold per tonne. Other holes on the zone returned values between 0.79 and 33.08 grams per tonne gold over widths of 0.6 and 1.4 metres respectively.

Inel Resources Ltd. tested the AK zone on the Inel property (20). The zone is a mineralized breccia in the footwall of a porphyry dike and has a known strike length of 76 metres, a width of 6.1 metres and is open in all directions. The newly discovered Ninety-Eight zone is located 183 metres southwest of the AK zone along a porphyry dike contact and contains visible gold.

SULPHURETS AREA

The Sulphurets area became the focus of attention in mid-August when Calpine Resources Incorporated and Consolidated Stikine Silver Ltd. announced spectacular results from Hole 89-109 on the Eskay Creek property (21). Following the announcement there was a flurry of exploration activity in the area. The principal targets were gold-silver deposits found in quartz veins and siliceous breccias hosted by the volcanic and sedimentary rocks of the Jurassic Hazelton Group. Many companies keyed on the mineralized felsic volcaniclastic horizon identified by D. Alldrick and J. Britton of the British Columbia Geological Survey Branch during their 1988 mapping.

At Eskay Creek, Calpine Resources Incorporated spent $12 million on an extensive drilling program on the new 21-zone discovery. This zone has a strike length of 1300 metres, has been tested over 240 metres down dip and is open along strike and to depth. Mineralogy changes within the South, Central and North sub-zones of the 21-zone; generally base metals become more abundant and stibnite, realgar and orpiment less significant to the north. The gold mineralization is generally hosted by the

transitional argillite unit, although it occurs in both the hangingwall andesite and the footwall rhyolite. To the north the mineralization is more abundant in the footwall rhyolite. Yorkton Securities Inc. estimated reserves for the South sub-zone at 2.5 million tonnes grading 7.47 grams per tonne gold and 102.48 grams silver per tonne.

On the Sib property (22) of American Fibre Corporation, the emphasis has been on defining near surface mineralization. Drilling has indicated that the gold is not in veins but associated with sulphides in a brecciated unit.

On the Sulphurets property (24), Newhawk Gold Mines Ltd. continued delineating the West and R-8 zones through underground drilling and drifting. The recently discovered R-8 zone varies from 1.2 to 11.6 metres in width. It is a quartz-orthoclase vein and stockwork containing electrum and visible gold with tetrahedrite, silver sulphosalts, sphalerite and some chalcopyrite. The R-8 zone, a target of ongoing drilling, is open to depth but cut off at the top by a fault.

On the Treaty Creek claims (26) Teuton Resources Corporation was encouraged by drill results. Limited underground development was done on the Goldwedge property (23)of Catear Resources Ltd.

Copper-gold mineralization was the focus of attention on the Kerr prospect (25). Western Canadian Mining Corporation completed a drilling and geophysical program and has estimated drill-inferred reserves of 114.3 million tonnes of 0.61 per cent copper, 0.27 gram per tonne gold and 1.71 grams per tonne silver. This copper-gold porphyry deposit is open along strike and to depth. It is hosted by a sequence of sericitic and silicified felsic volcaniclastics. In October, Placer Dome Inc. acquired a controlling interest in the property by purchasing all the common shares in Sulphurets Gold Corporation from Western Canadian Mining.

STEWART MINING CAMP

Activity in the Stewart mining camp was centred around the start up of the Premier Gold mine (*see* Operating Mines, Table 1). Westmin Mines Limited continued to actively explore both the Silbak Premier (31) and Big Missouri (28) properties. At Premier underground drilling on the Power, 4G and 609 zones delineated additional reserves. On the Day zone, at Big Missouri, the drill-holes were a follow-up of significant intersections found in 1988. The drilling was to determine if the lower and middle mineralized horizons contain open-pit reserves. Westmin Mines also worked on the Myrtle and East Myrtle veins, an extension of the main Indian vein on the Indian (30) claims.

With the demise of Esso Minerals Canada, Tenajon Resources Corporation became sole owner of the Silver Butte property (29) situated slightly southwest of the Big Missouri mine site. Exploration drilling and drifting further defined the 35, West Kansas and Kansas zones.

Farther north, on the Korri-Hill property (27) a headframe and hoist have been installed in preparation for sinking a shaft to trace several veins and two zones of massive sulphide mineralization.

East of Stewart, Bond Gold Canada Inc. made significant discoveries on the Red Mountain property (32) and at Willoughby Creek (33). Both discoveries are hosted in pyroclastics and sediments of the Lower Jurassic Hazelton Group. At Red Mountain there are two intersecting, steeply dipping zones, the Marc and the Brad, which contain disseminated sulphide mineralization, mainly pyrite with some pyrrhotite and sphalerite. Drill intersections on the Marc zone varied between 1.16 grams per tonne gold over 142.5 metres and 23.35 grams per tonne gold over 16.5 metres with silver to gold ratios of 2:1 to 5:1.

South of Stewart Avatar Resources Corporation drilled on the Georgia River site (35) with the intention of extending the known reserves.

ALICE ARM AREA

Extending southward from the Stewart region into the Alice Arm area favorable Hazelton Group lithologies are again the target of exploration with the focus on gold-bearing veins and silicified zones, and conformable sulphide horizons. Immediately south of the Cambria Icefield, Noranda Exploration Company, Limited tested three zones within a large area of hydrothermally altered volcanics and sediments on the Homestake claims (34).

In the Kitsault Lake area Aber Resources Ltd. was active on the Kits property (36). A mineralized horizon with galena, sphalerite, barite and celestite is believed to be syngenetic and has been traced for over 5 kilometres.

Dolly Varden Minerals Inc. drilled on the Red Point (37) and North Star (38) properties which are located approximately 25 kilometres up the Kitsault River from the head of Alice Arm. On the Red Point three zones were drilled to confirm the grade and continuity of gold-copper mineralization. On the North Star the drilling intersected sphalerite, galena and barite mineralization with associated calcite and chert(?) which included 4.1 metres of 4.46 per cent zinc, 0.45 per cent lead, 0.1 per cent copper, 0.34 grams gold and 17.1 grams silver per tonne. The drilling confirmed the down-dip extension of the zinc-silver zone.

Northeast of Alice Arm, Great Northwest Resources Corporation completed work on three zones of the Illiance River property (39). Mineralization is disseminated or associated with quartz veinlets in altered volcanics cut by a number of parallel dikes.

TERRACE AREA

Quartz veins with associated sulphides and gold, silver, copper values were the target of drill programs on the Dick/Kit (40) and Usk (51) properties as well as the underground rehabilitation on the Lucky B property (41).

NORTH COAST

There was scattered activity on the coastal islands south of Prince Rupert. On the Porcher Island property (42) of Cathedral Gold Corporation a quartz diorite intrusion is cut by mesothermal subvertical quartz veins and shears containing gold in pyrite. Sublevel drifting and raising to test the No. 4 vein for grade and structural continuity confirmed the structure previously interpreted from diamond drilling.

On the east side of Pitt Island, Fairharbour Mining Corporation drilled a polymetallic massive sulphide zone within a highly deformed volcanic-sedimentary sequence on the Trinity property (43). The mineralization is hosted by felsic schists near the contact with mafic schists.

Laredo Limestone Ltd. carried out a drilling and chip sampling program in the Laredo quarry (44) on Aristazabal Island. Proven and probable reserves of limestone are 60.7 million tonnes.

TOODOGGONE RIVER AREA

Exploration activity in the Toodoggone River area was quieter this year than for the past number of years. The majority of programs were directed toward gold-silver epithermal veins hosted by Triassic Takla Group and Early Jurassic Toodoggone volcanics (equivalent to the Hazelton Group).

In the northern part of the camp, Cyprus Gold (Canada) Ltd. carried out a program on the Moosehorn property (45). The Moosehorn East zone and coincident induced polarization and geochemical anomalies south of the Toodoggone River were both tested by drilling.

Cheni Gold Mines Inc. was active in searching for further reserves at the Lawyers mine site (46). Crosscut drifting and underground drilling defined additional reserves in a brecciated zone below the 1700 level currently being mined.

Homestake Mining Canada Ltd. conducted an extensive exploration program on the Creek, JM, O and Far East zones on the Shasta property (47). Detailed drilling increased the quantity and quality of delineated reserves on the JD and Creek zones. Sable Resources Ltd., International Shasta Resources Ltd. and International Taurus Resources Inc. mined two small open pits on the JM and Creek zones (*see* Operating Mines, Table 1).

In the Finlay River area the Grace claims (48) were percussion drilled by Skylark Resources Ltd. A number of holes were for deep overburden sampling and the remainder tested the strike extension of the Electrum zone and other newly discovered zones. The gold-silver mineralization is generally found within propyllitic and argillically altered Toodoggone volcanics.

Two companies were working on porphyry-style mineralization south of the Finlay River and to the east of Thutade Lake. Drilling on the New Kemess claims (49) of El Condor Resources Ltd. intersected wide zones of anomalous copper-gold values such as 0.15 per cent copper and 0.34 gram per tonne gold over 57 metres. On the Mess property (50) Inco Gold Company encountered weak copper, zinc, lead and silver mineralization within shallow dipping, silicified zones in altered mafic volcanics.

HAZELTON-SMITHERS AREA

The Morningstar property (52), within the Skeena river drainage west of Hazelton, was drilled by Equity Silver Mines Ltd. At the contact between a granodioritic intrusion and sedimentary rocks, a hornfelsic argillite contains small veinlets of pyrite and arsenopyrite with minor sphalerite and chalcopyrite.

Southwest of New Hazelton, Southern Gold Resources Ltd. worked on the old Rocher Déboulé mine (53), a past producer of copper, gold and silver. Southern Gold rehabilitated the 300 level on the No. 4 vein and trenched on the newly discovered 2A vein.

Noranda Exploration Company Limited explored both on the mine site at Bell (55) and approximately 25 kilometres northeast at Hearne Hill (54). Drilling at Hearne Hill concentrated on the definition of a small mineralized breccia pipe containing significant chalcopyrite mineralization. At the Bell mine site an extensive drilling program was undertaken outside the present pit boundaries with the hope of finding reserves which would extend the mine life beyond the present 1992 projection. Mineralization was encountered at depth and a follow-up program is anticipated.

The Fireweed property (56) of Canadian-United Minerals Inc. is on the south side of the Northwest Arm of Babine Lake. The silver-zinc-lead mineralization is within Cretaceous Skeena Group sandstones. Six zones are known on the property and drilling in 1989 concentrated on the Jan, the 1600 and the East zones. Drill indicated reserves on the West zone are 580 600 tonnes of 341.8 grams per tonne silver, 2.22 per cent zinc and 1.34 per cent lead.

Situated 25 kilometres east of Smithers the Dome Mountain project (57) has been beset for several years by litigation and dispute. Teeshin Resources Ltd. and Canadian-United Minerals Inc. conducted a drilling program to test three new anomalies and a mineralized outcrop area with the intent of expanding the known

reserves. The ore reserves of the Boulder and Argillite zones are in quartz-carbonate veins within a major shear.

Thirty-three kilometers west of Smithers Corona Corporation drilled a highly altered feldspar porphyry intrusion on the Louise Lake property (58). Low grade copper, gold and molybdenum values were found in the core.

HOUSTON-WHITESAIL LAKE AREA

Mount Harry Davis, several kilometres northeast of Houston, is the site of the HD claims (60) drilled by Equity Silver Mines Ltd. Zinc, lead, copper, silver and gold mineralization occur in veins associated with red and green intermediate to rhyolitic tuffs cut by small andesitic dikes.

Noramco Explorations Inc. conducted a drilling program at the Bob Creek site (61), 10 kilometres south of Houston. Located on the west edge of the Buck Creek caldera, the property is considered to have potential for a low-grade large-tonnage gold-silver-zinc-copper deposit.

At the old Silver Queen (Nadina) mine site (62), 35 kilometres south of Houston, Pacific Houston Resources Inc. completed an underground drilling and drifting program. Surface mapping, stratigraphic correlation, radiometric dating and petrographic studies were undertaken by a team of researchers from The University of British Columbia. Objectives of the 1989 program were to gain a detailed understanding of the mineralogy and to develop an ore deposit model to assist exploration for additional reserves. The deposit is an epithermal gold, silver, zinc, lead and copper vein system hosted by Tip Top Hill volcanics which are believed to belong to the Upper Cretaceous Kasalka Group.

On the Hagas property (63), on the south side of the Morice River southwest of Houston, Progold Resources tested three mineralized zones containing pyrite and associated copper, silver, lead, zinc and gold mineralization.

At the end of the year Swift Minerals Ltd. was drilling the Hill prospect (64) near Nadina Lake.

On the south side of Tahtsa Lake, on the Ox property (65), Granges Inc. completed six holes on the Damascus zone, a small mineralized shear and vein containing silver, lead and zinc.

Equity Silver Mines Ltd. conducted drill programs on the Wing (66) and Kate (67) properties located approximately 10 kilometres to the west of Troitsa Lake. Gold and silver mineralization was the target of exploration within the ash to lapilli tuffs containing thin interbedded polymictic conglomerates on the Wing and minor siltstone and andesitic dikes on the Kate.

Golden Knight Resources Inc. was successful in its bid to the British Columbia Ministry of Energy, Mines and Petroleum Resources for a lease on the Deerhorn property (68) in the Tweedsmuir Recreation Area. A $900 000 program was carried out with surface mapping and drilling together with underground rehabilitation and mapping. The drilling program tested and delineated the strike length of the three known veins carrying gold and silver.

COAL

There was only one coal exploration program in northwestern British Columbia in 1989. Crows Nest Resources Ltd. continued its drilling program on the Telkwa coal project (59). Working on the north side of the Telkwa River, the intent of the program was to confirm the structural interpretation, improve coal quality information and obtain large cores for bulk samples to test the coal washability characteristics. Resistivity surveys were useful in delineating shallow coal reserves. The bituminous coal measures in the vicinity of Pine Creek on the north side of the Telkwa River are found within Cretaceous Skeena Group sediments and are fault bounded or subcrop to the west, south and east and are truncated on the north by an intrusion.

Gulf Canada Corporation was not active in the field on the Mount Klappan anthracite coal deposit, however, feasibility and marketing studies are ongoing.

PLACER

During 1989, 85 Notices of Work were filed for placer operations in northwestern British Columbia. Of these 39 were for the Atlin area. Queenstake Resources Ltd. was active on both Spruce and Pine Creeks just east of Atlin. At the Pine Creek site (69) twenty-five men were employed processing 229 366 cubic metres of pay gravel with production estimated at 233 138 fine grams of gold. Thirty men processed 99 392 cubic metres of pay gravel producing 143 997 fine grams of gold from Spruce Creek (70).

In the Liard Mining Division 38 Notices of Work were submitted. Integrated Resources Ltd. washed 4175 cubic metres of gravel producing 3.806 grams of gold from the Barrington River (11).

DEVELOPMENT PROJECTS

With the opening of new mines in the district, the number of projects in the development stage is reduced from last year. Current projects judged to be at the development stage are listed in Table 5.

In the Cassiar mining camp a $50 million development program on the McDame asbestos deposit (8) is ahead of schedule with the start up date projected to be April 1990

TABLE 5
DEVELOPMENT STAGE PROJECTS, NORTHWESTERN DISTRICT

Project		Company	Ore Reserves
8	McDame	Cassiar Mining Corporation	16 Mt; 5.6% asbestos
17	Snip	Cominco Ltd., Prime Resources	782.4 kt; 30.4 g/t Au
23	Goldwedge	Catear Resources Ltd.	Golden Rocket Zone: 290 kt; 26.4 g/t Au, 230.7 g/t Ag
24	Sulphurets	Newhawk Gold Mines Ltd., Granduc Mines Limited	West Zone 7.7 kt; 12.14 g/t Au, 786.5 g/t Ag

at a daily production of 340 tonnes. There are now a total of 6 kilometres of underground workings at McDame. Underground diamond drilling has increased ore reserves (*see* Table 3) and potentially extended the mine life from 10 to 13 years. Block caving methods will be used to mine the ore.

Development work slowed down on the Snip project, as Cominco focused on refining its ore reserve calculations by completing 489 underground drill holes on the Twin zone. Further improvements were made to the Bronson Creek airstrip and the camp. A feasibility study was in progress at the end of the year with the possibility of a production decision in 1990. Completion of the Iskut access road would definitely improve the economic viability of this project.

On the Sulphurets property underground development and drilling were focused on the West, UTC and newly discovered R-8 zones. A total of 79 surface and underground drill holes and 1582 metres of underground development were completed to increase the ore reserves. The first 39.6 metres of drifting on the R-8 zone on the 1200 level averaged 51.8 grams gold and 588.3 grams silver per tonne across a true width of 2.5 metres. In early 1989 Newhawk Gold Mines Ltd. submitted its Stage 1 report. A full-scale production feasibility report is scheduled for completion early in 1990.

Catear Resources Ltd. submitted a Stage 1 report in 1989 on the nearby Goldwedge property (23) and completed minor underground development on the project.

OPERATING MINES

A total of eight mines operated in the Northwestern District during 1989 (Figure 5). Collectively they employed more than 1050 workers and played a very important economic role. The base metal open-pit mines enjoyed continuing high prices for copper; however, the gold mines suffered from falling gold prices for most of the year.

Construction at the Golden Bear project (71) (*see* Plate 1) was put on hold in late 1988 pending re-evaluation, because costs were higher than originally anticipated. In particular the 150-kilometre access road cost $17 million, almost twice the original estimate. In April, Chevron Canada Resources Ltd. and Homestake Mineral Development Company decided to proceed with mine construction. Open-pit mining started in the summer with some underground mining in the fall and enough ore was stockpiled to run the plant through the winter. Utilizing the latest technology, the plant uses dry grinding, fluidized-bed roasting and carbon-in-pulp leaching to recover the gold. At the end of the year the 360 tonne per day facility was in the start-up phase.

The Erickson gold mine (9) remained closed for the entire year although a very aggressive exploration program was completed. Drifting on the adit being driven to access the Michelle Zone was stopped approximately half way to its target.

At Cassiar Asbestos (72) open-pit mining continued until June 1, 1989 when the danger of a potential pit-wall failure halted the mining operation. The pit still contains approximately 54 000 tonnes of ore which may be recovered in 1990. Cassiar stockpiled 1.6 million tonnes of ore as of June, to ensure sufficient feed for the mill until the McDame deposit starts to produce.

The Johnny Mountain mine (18) completed its first full year of operation with an output of 794 690 tonnes of ore grading 18.9 grams gold per tonne. The mill was simplified with the elimination of the cyanide circuit; the gold is now being recovered by both a gravity circuit and in a copper concentrate containing byproduct silver. Current throughput in the mill is 308 tonnes per day. Most of the production has come from the No. 16 vein with the reserves now extended to the 700 level.

The Premier Gold mine opened in May, 1989. Open-pit mining of low-grade deposits on the Silbak Premier and Big Missouri properties supplied the mill with ore. The mill initially operated with 234 894 tonnes of low-grade development-ore mined in 1988 from the Dago and Silbak Premier pits. As of the end of September, 159 899 tonnes of ore and 2.57 million tonnes of waste have been mined from the Premier, Dago and S-1 pits. The first doré bar was poured in early June. The mill approached its 2000 tonne per day capacity in October with a total of 59 660

FIGURE 5

OPERATING MINES IN
NORTHWESTERN BRITISH COLUMBIA
1989

LEGEND

- Open Pit
- Underground
- Geologists' Areas
- Mining Districts

CU=COPPER,AU=GOLD,AG=SILVER,MO=MOLYBDENUM

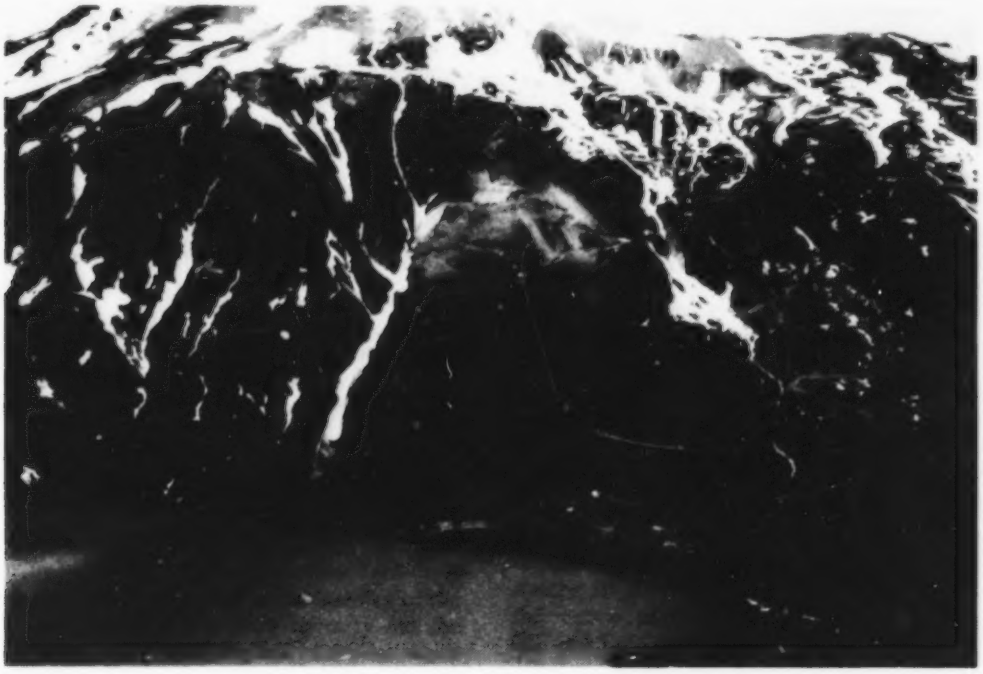


Plate 1. The Golden Bear site in May. Note camp on shore of Muddy Lake and the road to the Bear zone portal behind it.

tonnes processed at an average grade of 2.48 grams gold per tonne.

In the Toodoggone camp the Lawyers mine (46) overcame start up problems caused by bitterly cold weather in December and January and followed by labour unrest. All production was from the AGB zone. A total of 151 590 tonnes with an average grade of 10.42 grams gold and 241.4 grams silver per tonne was milled at a rate of 460 tonnes per day. Initial development work was started on the Cliff Creek zone and late in the year Cheni Gold Mines entered into agreement with Energex Minerals Ltd. to obtain the rights to mine several deposits on the Al property.

Sable Resources Ltd. started open-pit mining in the summer on the Creek and JM zones of the Shasta property (47). There had been no previous production from this property although several companies, including Newmont Exploration of Canada Ltd., Esso Minerals Canada and Homestake Mineral Development Company have completed extensive drill programs on the claims. A total of 36 300 tonnes was mined and stockpiled. The mill at the old Baker mine has been leased from Dupont of Canada Inc. and operated at the rate of 139 tonnes per day from September 27 to December 31, 1989 for a total of 12 247 tonnes. The ore averaged 8.91 grams gold and 34 grams silver per tonne milled.

Bell mine (55) on Babine Lake maintained its production levels at approximately 15 000 tons per day with an average grade of 0.41 per cent copper and 0.240 gram gold per tonne. The current pit has an anticipated life extending to 1992; a major exploration drilling program was completed around the pit and on the property looking for new ore reserves.

Southeast of Houston the Equity Silver mine (73) started mining from the Waterline zone, although the bulk of production came from the Main zone. Production levels were similar to 1988 with a daily mill throughput of 8 500 tonnes grading 113 grams per tonne silver, 1 gram per tonne gold and 0.3 per cent copper.

SOUTHWESTERN DISTRICT

By H.P. Wilton and S.N. Pfuetzenreuter, District Geology, Victoria

INTRODUCTION

The Southwestern District experienced a significant reduction in exploration activity in 1989. The number of advanced projects, defined as those which involved drilling, large-scale trenching or underground exploration (*see* Table 3), was only two-thirds of the 1988 total. Most of the more advanced projects, particularly those operated by major companies, had the funding necessary to maintain activity at or above the level of previous years. However, many less advanced properties, or those operated by junior mining companies, remained relatively inactive through 1989, mainly due to the inability of the operator to raise funding necessary to carry out the planned programs. The continuing low gold price was a major contributing factor, as indicated by the fact that some very promising, advanced gold projects were dormant in 1989 (*e.g.* Abo, Ashlu and Kennedy River/Bear) and others were scaled back (*e.g.* Mount Washington and Spud Valley). In contrast, there was increased interest in deposit types such as skarns, porphyries and volcanogenic massive sulphides which are characterized by significant base metals enhanced with precious metal values. For instance, interest remained high in the gold-bearing skarns of Texada Island and northern Vancouver Island and in the polymetallic massive sulphides of the Sicker belts and the Britannia - Indian River pendant. Falconbridge Limited re-investigated its Catface porphyry copper property for the first time since 1972. Although activity remained subdued in the epithermal gold belt of the Queen Charlotte Islands, Cimadoro a newly discovered polymetallic massive sulphide occurrence on northern Moresby Island directed new interest toward the Queen Charlottes late in the year.

The most promising new exploration projects in the Southwest District in 1989 have been the Merry Widow south of Port McNeill, where Taywin Resources Ltd. has discovered widespread gold values associated with base metal sulphide zones in skarn, and the Giant Copper property southeast of Hope, where Bethlehem Resources Corporation is exploring gold-silver-copper mineralization in intrusive breccia zones.

Only one industrial mineral project, Lang Bay 'kaolin', underwent any significant exploration in 1989 although it had also become dormant by year-end. An important change, however, in the industrial minerals area has been the renewed interest in dimension stone quarrying. Several small granite quarries on the mainland coast, and marble quarries on Vancouver Island, are being developed or have been proposed. No coal exploration is known to have been carried out except for some development drilling at the producing Quinsam mine. Placer activity has been minor and intermittent on the Fraser River and in the Leechtown area but a large placer gold surface mine and processing plant are being planned for a site on the Lillooet River north of Harrison Lake.

A significant event in the Southwest District in 1989 was the release in June of Regional Geochemical Survey data for NTS sheets 92E, L and K. It generated increased staking activity both prior to and immediately following the release, particularly in the under-explored areas of 92E and 92K. Time will tell how much of the new staking will lead to significant new discoveries, but it is fortuitous that the data release coincided with a period of renewed interest in polymetallic massive sulphides, skarns and porphyries, all of which are important target types in the area. Data for the remainder of Vancouver Island and the Vancouver sheet (92G) will be released in 1990.

MINERAL EXPLORATION

Table 3 lists all those exploration projects in the Southwest District on which some significant amount of drilling or underground exploration is known to have been done in 1989. The map numbers listed in the table and shown in brackets after property names in the following text are keyed to the location map, Figure 2.

VANCOUVER ISLAND

As in the past several years, the greatest concentration of exploration expenditure on Vancouver Island, outside of the two producing metal mines, was at the Chemainus end of the Cowichan uplift of Sicker Group rocks, where two major companies continued to explore for new reserves of polymetallic massive sulphides in sheared felsic volcanics of the Paleozoic McLaughlin Ridge Formation. Minnova Inc. drilled 4253 metres in 44 holes at the Lara property (76) optioned from Laramide Resources Limited. Some of the drilling was directed at increasing reserves in the Coronation zone where the previous operator, Abermin Corporation, had estimated drill-indicated reserves of 529 000 tonnes averaging 1.01 per cent copper, 1.22 per cent lead, 5.87 per cent zinc, 130.1 grams per tonne silver and 4.73 grams per tonne gold. However, most of the 1989 drilling tested other anomalous zones on

the property. Minnova also drilled 3148 metres in 16 holes on its adjoining Mount Sicker property (75), part of which has been optioned from Wind River Resources Ltd. (formerly Canamera Explorations Inc.). Falconbridge Limited drilled a total of 11 500 metres in 33 holes distributed among various zones on its large Chemainus property (77) which adjoins the Lara property on the east and west. Falconbridge exercised its right of first refusal to purchase the 50 per cent ownership of the property offered for sale by Esso Minerals Canada and is now the sole owner and operator.

The only other major project undertaken within the Sicker rocks in 1989 was the ongoing Debbie/Yellow project (78) which is a joint venture of Westmin Mines Limited and Nexus Resource Corporation, with Westmin as operator, By early February, the 2-kilometre-long tunnel through McLaughlin Ridge was complete with two crosscuts and some raises into the Mineral Creek zone. Chip sampling across the zone where exposed in a crosscut on the Yellow claim indicated an average grade of 6.2 grams per tonne gold over 9.5 metres, a grade significantly higher than averages projected from previous drill intersections. Underground drilling from stations within the tunnel was carried out immediately following completion of mining (four holes) and resumed in a second phase of drilling late in the year (nine more holes), the objective being to test deeper levels within the Mineral Creek zone, a steeply inclined, quartz-carbonate-altered regional fault. Trenching of the Linda zone, a quartz-veined shear zone in the hangingwall of the Mineral Creek fault, exposed impressive gold mineralization. An average of 42.2 grams per tonne gold over a 15-metre strike length and an average true width of 1.86 metres was reported. A fall program of surface drilling totalled 850 metres in twelve holes on the Linda zone and approximately 515 metres in eight holes on the 900 zone which consists of a high-grade gold-quartz stockwork superimposed on an auriferous chert horizon located 1.6 kilometres southwest of the Mineral Creek zone. A preliminary mineral inventory for the three zones combined has been published by Westmin and totalled 243 130 tonnes probable, averaging 5.15 grams per tonne gold with an additional 518 000 tonnes possible of unspecified grade.

A promising new project which has attracted considerable attention is the Merry Widow (94) of Taywin Resources Ltd. located in the Benson Lake skarn camp south of Port McNeill. Approximately 3.4 million tonnes of magnetite iron ore were produced from the Merry Widow mine and adjacent Kingfisher and Raven pits during the 1950s and 1960s. Taywin discovered that significant areas of gold-rich, skarn-hosted sulphide mineralization are exposed in the walls of the Merry Widow pit and several surface showings to the north and south. The company spent about $450 000 in 1989 to explore the gold potential with 43 drill holes totalling 2713 metres as well as trenching and geophysical surveys. The gold-bearing sulphides appear to be structurally controlled and distributed among three or four parallel zones over a strike length of at least 400 metres. Typical drill intersections average 5 to 9 grams per tonne gold with up to 1 per cent copper over widths of 15 to 30 metres.

Another skarn-hosted, gold-rich sulphide occurrence explored in 1989 is the Hiller-Churchill property (86) northwest of Zeballos, owned by Falconbridge Limited and held under option by Footwall Explorations Ltd. which drilled underground from an adit completed in 1988 on the Hiller 25 zone. Hisway Resources Corporation explored two skarn-related prospects at the north end of Vancouver Island. The HPH property (96) west of Port Hardy and southeast of Nahwitti Lake covers several showings, most of which are manto or replacement-type massive silver-lead-zinc sulphide zones. Hisway drilled six holes totalling 506 metres on the HPH and has begun exploration, with one hole drilled so far, on a property at Quatse Lake (95) which includes the Caledonia copper-zinc-silver skarn deposit. Although the project is not yet at the drilling stage, encouraging trench assays were reported by Battle Mountain (Canada) Inc. from its preliminary program on the Beano property located just south of Zeballos and optioned from Billikin Resources Inc. The mineralization is described as massive pyrrhotite zones in actinolite skarn. One of the better trench samples to be reported this year assayed 71.2 grams per tonne gold over 5 metres.

Symptomatic of the revived interest in base metal exploration is the fact that Falconbridge Limited mounted a program to re-examine and resample its Catface porphyry copper-molybdenum prospect (80) located 10 kilometres northwest of Tofino. Exploration prior to 1972 had outlined a main zone containing a drill-indicated reserve of 181 400 tonnes averaging about 0.35 per cent copper. The company resampled the old workings on the main zone, completed extensive air and ground geophysical surveys, drilled three other anomalous zones, and is optimistic about the potential for increased reserves. The mineralization is directly associated with porphyritic quartz diorite intrusions of Tertiary age. In the porphyry belt extending northwest from the Island Copper mine, Moraga Resources Limited drilled seven holes totalling 764.4 metres on the Expo property (97) optioned from BHP-Utah Mines Ltd. The drilling was done adjacent to the Red Dog porphyry copper-molybdenum-gold deposit recently under option to Crew Natural Resources Ltd. and reported to contain reserves in excess of 45 million tonnes. On the Red Dog property itself, Crew National Resources conducted detailed geological studies but did no further physical work in 1989.

Among the strictly gold-oriented projects on Vancouver Island, the most advanced is the Spud Valley

project of McAdam Resources Inc. at Zeballos (84). Underground exploration drifting continued on several gold-bearing vein structures with particularly interesting results reported from the 7A sublevel on the Linton North vein, where continuous panel samples from 14 metres of drift averaged 26 grams per tonne gold over a 1.2-metre mining width. A small test mill was completed on the property by early October and has been processing ore recovered from the exploration drifts and from a stockpile on surface. The most recent reserve figures published by the company were 220 000 tonnes averaging 10.8 grams per tonne gold. Also at Zeballos, a 50/50 joint venture between CanAlaska Resources Ltd. and New Impact Resources Inc. completed 21 underground drill holes totalling 2195 metres, at the former-producing Central Zeballos mine (85). They are attempting to increase the proven and possible reserves beyond the presently reported 68 000 tonnes at 12.0 grams per tonne gold. The targets on both of these Zeballos projects are mesothermal quartz-sulphide veins in shear zones cutting the Tertiary Zeballos quartz diorite stock.

At the Mount Washington epithermal gold-silver-copper camp west of Courtenay, exploration activity was scaled down in 1989 as Better Resources Ltd. completed only minor trenching and 17 short drill holes in the Lakeview zone at the Mount Washington property (91). Published reserves remain at 550 300 tonnes of drill-indicated ore averaging 6.75 grams per tonne gold and 32.2 grams per tonne silver. On the east side of the mountain, Noranda Exploration Company, Limited drilled two very short holes into the Murex breccia zone (92), optioned from Better Resources, where locally gold-rich massive copper mineralization occurs in the matrix of an extensive, tabular breccia zone. On the CIH claim (87) near Fanny Bay, prospector Bert Buskell drilled two short holes to test the subsurface character of an arsenopyrite-rich quartz-vein stockwork with low gold values hosted by a large felsite dike. This occurrence is believed to be of Tertiary age and related to the gold mineralizing event at Mt. Washington.

Other gold projects of note on Vancouver Island include the Lucky property (79) north of Toquart Bay where Freemont Gold Corporation and partners, under an option agreement with Electrum Resource Corporation, drilled six holes to further test locally high-grade gold in a quartz vein. On Ursus Creek west of Sproat Lake (81), the Prime Resources Group drilled five holes totalling 792.5 metres on a property owned by Pacific Sentinel Gold Corporation. The target is gold in quartz veins localized within a major east-striking shear zone. On Cotter Creek near the head of Herbert Inlet (82), Stoney Creek Mines Ltd. and Gold Parl Resources Ltd. cooperated on the staging of small drill programs on adjoining claim groups both optioned from prospector Sam Craig. Included within one of the groups is the former Mary McQuilton or Abco gold mine which is reported to have produced 78 tonnes yielding more than 7200 grams of gold and minor amounts of silver and copper.

Finally, the only major exploration project south of Cowichan Lake continued to be the Valentine Mountain property (74) of Beau Pré Explorations Ltd. north of Sooke, where erratic high gold values are found in a persistent system of narrow quartz veins in the axis of a major anticlinorium within the Leech River metamorphic complex. Noranda Exploration Company, Limited explored the property under option from Beau Pré and carried out extensive surface surveys and mapping followed by five diamond-drill holes.

TEXADA ISLAND

Freeport-McMoRan Gold Company, encouraged by several wide intersections of high-grade skarn-hosted gold-silver-copper mineralization encountered in late 1988 drilling below the Little Billie mine workings, continued comprehensive work on the extensive holdings of Vananda Gold Limited which extend across the island from Vananda to Gillies Bay (89). The program culminated with the drilling of 5208 metres in 22 holes distributed among several zones. Echo Bay Mines Ltd., which had, in 1988, systematically surveyed most of the large North Texada property (90) optioned from Rhyolite Resources Limited, focused its exploration activity in 1989 at the extreme north tip of the island where trenching, drilling, and detailed mapping of skarn mineralization was carried out at the Paris showing and adjacent to a small diorite stock east of Blubber Bay. Drilling totalled 2488 metres in nine holes. At the Angel showing (88) in central Texada Island, where erratic gold values occur in narrow quartz veins associated with the strongly ferrocarbonate-altered hangingwall of a regional fault, Nexus Resource Corporation completed I.P. surveys and drilled 540 metres in five holes. The property was optioned by Nexus from Rhyolite Resources Limited.

SOUTHWESTERN MAINLAND

The highlight project in the mainland part of the district was the Giant Copper property (102) of Bethlehem Resources Corporation, located at high elevation between Manning Park and the Skagit Recreation Area southeast of Hope. Several mineralized intrusive breccia zones occur on the property, the best known being the AM breccia pipe. Recalculated reserves based on pre-1989 data and limited mainly to the northern end of the breccia pipe are 3.355 million tonnes of underground reserves grading 1.17 per cent copper, 0.51 gram per tonne gold and 20.6 grams per tonne silver. Potential open-pit reserves have been calculated at 20.7 million tonnes grading 0.75 per cent copper, 0.41 gram per tonne gold and 12.0 grams per tonne silver. Rotary drilling in 1989 focused on

the relatively untested south and central parts of the breccia zone and has demonstrated that significant additional reserves exist in these areas. For example, one drill intersection graded 1.15 per cent copper over 50.3 metres. A newly discovered breccia zone containing comparable copper and gold values, with locally high silver-lead-zinc, lies about 330 metres northeast of the AM zone and was extensively trenched and drilled in 1989. Other mineralized breccias occur on the property, most notably the Invermay breccia, but have yet to be explored in detail.

In the Britannia - Indian River roof pendant of Early Cretaceous Gambier Group volcanic rocks southeast of Squamish, Minnova Inc. continued systematic exploration by drilling on two separate optioned properties. At the divide between the headwaters of the Stawamus and Indian rivers, on a property optioned from International Maggie Mines Ltd. (100), Minnova drilled 2345 metres in seven holes in an ongoing search for volcanogenic massive sulphides in the "Slumach rhyolite". The Slumach rhyolite is an altered rhyolite fragmental unit with widespread low-grade zinc mineralization that stratigraphically overlies the Slumach polymetallic sulphide vein previously explored underground by International Maggie. In the Furry Creek valley (99), Minnova drilled 2372 metres in ten holes as part of an ongoing search for mineralization associated with the southeasterly extension of the Britannia mineralized "shear zone". This property is part of the former Anaconda holdings optioned by Minnova from Fleck Resources Ltd.

On a property called Easy and Jo (101), located on the Lillooet River opposite Skookumchuk and owned jointly by Hillside Energy Corporation and Corona Corporation, Kali Venture Corporation financed the drilling of a locally gold-bearing zone of strong shearing which is conformable with bedding in felsic tuffs of the Fire Lake volcanics. A similar gold-bearing, silicified and pyritized shear zone in carbonaceous argillites was drilled by Castle Minerals Inc. at the Wren property (105) on Rutherford Creek south of Pemberton.

A new project in 1989 was the underground drilling program carried out by McNellen Resources Inc. at Mount Foley (103), 24 kilometres east of Chilliwack. A total of 1519 metres of drilling was completed in 29 holes to test mineralization in the Lucky Four showing which consists of massive copper-molybdenum-gold-silver sulphides in garnetite skarn at the contact between a granodiorite intrusion and an argillite-greywacke assemblage, probably of the Chilliwack Group.

On Ladner Creek (104) near Hope, Anglo Swiss Mining Corporation (formerly Carolin Mines Ltd.) completed six surface drill holes on the McMaster zone and twelve underground drill holes on the Idaho zone. The company is optimistic about the potential for increased reserves and a substantially improved milling process which will enable it to justify re-opening the Ladner Creek gold mine. Existing proven and probable reserves are reported to be 816 500 tonnes grading about 4.1 grams per tonne gold.

QUEEN CHARLOTTE ISLANDS

Exploration remained low key on the Queen Charlotte Islands through 1989 but received a minor spurt of interest late in the year as a result of the activity of Teck Explorations Ltd. on the Cimadoro property (106) optioned from Doromin Resources Ltd. The property is located at the north end of Moresby Island, about 35 kilometres west of Sandspit. The mineralization of interest consists of two massive sulphide lenses, with variable amounts of precious and base metals, apparently stratabound within a chert-argillite package immediately below the base of the Late Triassic Karmutsen Formation. Teck drilled six holes totalling about 1000 metres to test the assumed mineralized horizon, potentially a new stratigraphic target for the Queen Charlottes.

At the Cinola gold property (107) on Graham Island, Barrack Mine Management Inc. took over as operator from City Resources (Canada) Ltd. and is still waiting for completion of a feasibility study. Meanwhile environmental reviews are ongoing and public meetings are proposed for early 1990. The only physical work carried out in 1989 consisted of three drill holes totalling 320 metres to recover HQ core from the orebody for metallurgical testing.

INDUSTRIAL MINERALS

At the Lang Bay kaolin project (98) south of Powell River, the joint venture of Fargo Resources Ltd. and Brenda Mines Ltd. completed a diamond-drilling project which had begun in late 1988 to further delineate the primary (residual) kaolin reserves. The most recent published reserve is 6 million tonnes. Upon completion of prefeasibility studies in May, Brenda Mines announced that it was withdrawing from the project and no further exploration has been done since that date.

No other industrial minerals properties are currently being explored in the district, but there has been a significant increase in interest in dimension stone quarrying in 1989. Small amounts of granite tile have been produced from a quarry on Fox Island and quarry development is proposed at Sechelt, near Squamish, and at the former producing quarry on Knight Inlet. A new marble quarry at Bonanza Lake on Vancouver Island has also been proposed for development.

PLACER ACTIVITY

Platinate Minerals and Industries Ltd. (affiliated with Metals Research, S.A.) which owns and has been sys-

tematically testing 104 placer leases along the Lillooet River and its tributaries north of Harrison Lake since 1975, successfully completed a series of test runs in 1989 on material mined from placer lease 9790 near Douglas. Large-scale production at a rate of as much as 9000 tonnes per day is proposed in a larger plant currently being designed.

Other gold placer activity consisted of a few minor and intermittent operations on the Fraser River north of Hope and in the Leechtown area of Vancouver Island.

COAL EXPLORATION

No coal exploration is known to have occurred on Vancouver Island or elsewhere in the Southwest District in 1989, except for some development drilling at the producing Quinsam mine.

PRODUCING MINES

There are currently three producing mines in the Southwest District and no new mines under development. There are also three producing limestone quarries on Texada Island and a few claystone and marl producers on Vancouver Island and in the Fraser Valley.

At Myra Falls (108) on Vancouver Island, Westmin Mines Limited continued in full production from the H-W and Lynx mines at a milling rate of approximately 4000 tonnes per day. Published reserves at the start of 1989, totalling all categories in all orebodies, were 12.1 million tonnes averaging 2.34 per cent copper, 0.35 per cent lead, 5.19 per cent zinc, 2.4 grams per tonne gold and 34.3 grams per tonne silver. Exploration drifting and underground drilling continued in various areas on the property with a 1989 exploration budget of $6.5 million. The current accelerated exploration program is generating some encouragement as several good massive sulphide intersections have recently been reported which appear to represent newly discovered deposits, so far of unknown size or significance.

BHP-Utah Mines Ltd. continued to mine and mill ore at a rate of approximately 50 000 tonnes per day from the Island Copper orebody (109) at Rupert Inlet near Port Hardy. An impermeable slurry wall has been completed as a first step in pushing back the south pit-wall toward Rupert Inlet, thereby adding about four additional years to the mine life. Current recoverable reserves, including those to be accessed by the south-wall push back, are estimated at about 53 million tonnes grading 0.48 per cent copper, 0.023 per cent molybdenum and 0.24 gram per tonne gold. These reserves will be exhausted by the late 1990s but the company is continuing an aggressive and systematic exploration program to firm up additional reserves on the mine property. The 1989 program included 36 diamond-drill holes, totalling 8621 metres, distributed among several zones.

At Middle Quinsam Lake near Campbell River, Brinco Coal Corporation operates the Quinsam open-pit coal mine (110). Total thermal coal production in 1989 is estimated at about 200 000 tonnes. Planning is currently underway to begin underground production during 1990.

SOUTH-CENTRAL DISTRICT

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INTRODUCTION

The overall level of mineral exploration and development in south-central British Columbia was slightly lower during 1989 than in the previous two years, when record levels were attained. Although the total number of exploration projects was approximately the same as 1988, there was about a 25 per cent reduction in the number of major projects (*i.e.* project expenditures of $250 000 or more). This downturn can be attributed primarily to reduced funding levels for junior exploration companies and secondly, to the attraction of the bulk of the province's market-based funding to high-profile projects in remote areas of northwestern British Columbia.

Despite these factors, and because of the long term commitment to the region by several major mining and exploration companies, an estimated $20 million was spent on surface and underground exploration and drilling projects. An additional $50 million is estimated to have been spent on development at mining and milling operations in the district, bringing the total estimated 1989 exploration and development budget for south-central British Columbia to the order of $70 million.

HIGHLIGHTS

A new mining camp was established during 1989 in the Adams Lake area with the official opening of the Minnova Inc. Samatosum mine in October. In just three years since its discovery, this high-grade silver-rich deposit has been developed into one of the most profitable mining operations in the province.

The district's second new mine to be brought into production during the year was the Afton Operating Corporation Ajax porphyry copper-gold deposit. This deposit, together with the others in the Iron Mask batholith, has provided British Columbia with an important exploration model that has accelerated the discovery and advanced exploration of such notable projects as Mount Polley, Mount Milligan and others in the Intermontane Upper Triassic island arc volcanic belt.

New potential has also been established for intrusive-hosted epithermal lode gold deposits with the discovery of the Elk prospect at Siwash Lake by Fairfield Minerals Ltd. This discovery is less than two kilometres from Phase 3 of the Coquihalla Highway and may well contribute to maintaining a strong mining industry in the Okanagan-Similkameen region after the Brenda mine, 20 kilometres to the east, ceases operations in 1990.

Exploration in the Okanagan region was maintained despite a scarcity of funding for several current projects. A new higher grade gold zone was outlined by Inco Gold Management Inc. on the Vault deposit, which has substantially enhanced the project's outlook and the epithermal potential of the area in general.

Two areas in the district experienced reduced levels of exploration and development during 1989. A 15-week strike at the Highland Valley Copper operations greatly reduced copper production and profitability of the region. In the Bridge River gold camp the absence of exploration funding for several major projects has seriously affected the area's economy and left important mineral potential under developed.

SUMMARY OF EXPLORATION ACTIVITIES

ADAMS LAKE AREA

The search for stratiform polymetallic sulphide deposits continued throughout the Eagle Bay assemblage and Fennell Formation. Minnova Inc. was the main operator in the area, with two-thirds of all exploration projects. Much of its effort was concentrated on claim groups in the Samatosum mine area, on properties including the Victory (111), OK (112) and Dixie (113). Immediately southeast of the mine, Homestake Mineral Development Company operated drilling programs on the Kamad (114) and Cana (115) properties and surface exploration on the Twin Mountain (116) prospect. These properties were recently acquired by Homestake from Esso Minerals Canada. Farther southeast, Falconbridge Limited completed a drilling program on the Bay claims (117), exploring the same mafic volcaniclastic sequence that hosts the Samatosum deposit.

North of the Barriere River, Minnova operated drilling programs on FY/Anna (118) and Biere (119) claim groups in Eagle Bay rocks and on the Chinook Mountain (120) and Chu Chua (121) properties in the Fennell Formation. The Chu Chua property is a joint venture with International Vestor Resources Ltd., Quinterra Resources Inc. and Pacific Cassiar Limited. Recently published geological reserves in the deposit are approximately 1.04

million tonnes, grading 2.97 per cent copper, using a 1 per cent copper cut-off grade.

KAMLOOPS - BONAPARTE AREA

In the Vidette Lake area Inco Gold Management Inc. completed a two-phase drilling program on the Epi/Yard claim (122), where the target is epithermal precious metals related to presumed Tertiary structures cutting Nicola volcanic rocks. Similar lode gold targets were drilled by QPX Minerals Inc. to the southeast on the Bonaparte property (123). To the southwest at the Arrowstone property (124), Iron River Resources Ltd. tested epithermal base and precious metals mineralization associated with chalcedonic quartz veins. Brenda Mines Ltd. drilled geophysical anomalies associated with copper-gold porphyry mineralization on the Rayfield River property (125) southeast of Green Lake. Northwest of Little Fort, Teck Explorations Ltd. completed a comprehensive surface program on a gold-bearing skarn prospect on the Haida claims (126). To the south, near Barriere, Michael Resources Ltd. initiated a drilling and sampling program for industrial feldspar on the G-Claims (127). Teck Explorations Ltd. also drilled a copper-gold porphyry target in the north extension of the Iron Mask batholith, on the Iron Mask property (128) near Kamloops Lake. To the northeast of Kamloops, R. Steiner drilled the Morgan prospect (129), where precious metals values are associated with copper and arsenopyrite.

South of Kamloops Lake and west of the Afton mine, Menika Mining Ltd. completed geophysical work and drilling on the Maskam (Beaton) property (130). Skyrocket Exploration and Resources Inc. drilled four holes on the Boy claim (131) to the southeast. Farther to the west, Mad River Resources Inc. drilled the Model-Anne prospect (132), where anomalous mercury values occur in Tertiary Kamloops Group volcanic rocks.

On the south side of the Iron Mask batholith, exploration continued near the Ajax mine for alkaline porphyry copper-gold mineralization. Brenda Mines Ltd. undertook surface mapping, geophysical surveys and subsequently drilled the Oz claims (133), while to the east, Cominco Ltd. completed an extensive rotary percussion drilling program on the Edith property (134).

NICOLA BELT

In the central Nicola belt, between Kamloops and Merritt, several lode gold-silver targets were explored. Naxos Resources Ltd. completed first-phase diamond and rotary percussion drilling programs in mafic rocks of the Nicola sequence on the Road 4 (135) and JJ (136) properties north of Shumway Lake. To the north and east A. Babiy drill-tested the Vicars (137) and Powl (138) copper-gold prospects. East of Stump Lake, Anglo American Resources Inc. drilled several geophysical targets on the Mary Reynolds gold prospect (139). Farther west near Desmond Lake, Menika Mining Ltd. intersected copper mineralization in Nicola basaltic rocks on the Des property (140). South of Merritt, at Iron Mountain, Golden Dynasty Resources Ltd. drill-tested polymetallic sulphide targets on the Leadville and Charmer prospects (141), where barite, gold and base metals occur in steeply dipping veins hosted in Nicola mafic tuffs.

OKANAGAN

Exploration activity in the northern Okanagan region was lower in 1989 than in 1988. The Brett project (142), at Whiteman Creek, was again the most active property in the area. Corona Corporation and Huntington Resources Inc. have completed a three-phase drilling program on the Brett which extended the known epithermal mineralization of the main shear zone farther to the north. As operator, Corona plans to re-evaluate results accumulated to date before planning further work. South of Whiteman Creek Eureka Resources Inc. intersected anomalous precious metals values in Eocene basaltic tuffs on the Miller property (143) north of Terrace Mountain. To the west, Clifton Resources Ltd. drilled the CLF/Exam claims (144) for epithermal precious metals in the Tertiary volcanic sequence. To the north near Westwold, Corona Corporation also drilled the Jewel property (145), a copper-gold prospect associated with Tertiary structures.

East of Vernon, BP Resources Canada Ltd. completed a drilling and sampling program on the Lavington property (146). At Lumby, Zicton Gold Limited drilled the BS claim (147) and J. Hilton drilled the OK property (148). In this area, gold mineralization is associated with quartz veins in sheared graphitic sedimentary rocks correlative with the Nicola Group.

In the southern Okanagan region, much of the exploration activity was focused on Eocene volcanic rocks centred around Okanagan Falls. Inco Gold Management completed its third major program on the Vault (149) epithermal gold project. Its efforts were divided between the "Main Zone", a deep, structurally complex epithermal vein system and the "North Vein", a shallower mineralized structure which extends to surface and is reported to have higher average gold grades than the Main Zone. To the east, Minnova Inc. completed a second comprehensive program on the Dusty Mac property (150). Farther east, Yukon Minerals Corporation drilled a porphyry copper-gold target on the Allendale property (151). At Venner Meadows, Inco Gold and Tigris Minerals Corporation completed drilling programs on gold-bearing epithermal quartz-carbonate mineralization in a trachytic volcaniclastic sequence similar to that of the Okanagan Falls area. At both localities (Inco's Au claims (152), Tigris'

Venner (153) property), the Eocene volcanic sequence is being explored down to the basement gneiss complex.

In the Camp McKinney area, Ark Energy Ltd. and Gold Power Corporation completed a joint venture drilling program on the Cariboo-Amelia property (154). Their efforts were oriented towards tracing a faulted extension of the historic main gold vein system. To the southeast Minnova Inc. continued drilling the Jolly gold prospect (155). Farther to the west Huntington Resources Inc. initiated gold exploration in foliated granitic rocks on the LMS claims (156). In the Beaverdell camp, Del Norte Chrome Corporation drilled several holes in a highly faulted silver-rich vein system on its Beaverdell property (157). To the south, on the Dominion property (158), Mad River Resources Inc. completed a drilling program for precious metals in Paleozoic Wallace Formation sediments. Battle Mountain (Canada) Inc. drilled several holes on the historic Dividend-Lakeview gold skarn property (159) near Osoyoos.

In the Marron Valley area, north of Olalla, Minequest Exploration Associates Ltd. completed a second-phase percussion drilling and trenching program on the Astro claims (160). West of Penticton, near Riddle Creek, drilling on the Vent (161) epithermal gold prospect was begun by Zygote Resources Ltd. Initial work is focused on pyritic tuffs cut by chalcedonic quartz veins. To the south, near Apex Mountain, Polestar Exploration Inc. began testing the industrial garnet potential on its Crystal Peak (Mount Riordan) property (162), in an area underlain by widespread skarn mineralization. The company has submitted a prospectus to develop a quarry for garnet production and is reviewing the requirements for Stage I of the Mine Development Review Process. Immediately to the west, at the Nickel Plate mine (163) and adjacent areas, Corona Corporation drilled several gold-bearing skarn occurrences. Some of these projects are joint ventures or option agreements with various partners and include the Nickel Plate, John/Taurus (164), Rollo Climax (165), Canty (166), Pride/Bullion (167) and Eagle's Nest (168). Corona has submitted a prospectus to the Mine Development Steering Committee to develop the Canty deposit. North of this area Redding Gold Corporation carried out a limited drilling program in a north-trending pyritic quartz vein system on the Golden Zone claims (169).

PRINCETON - TULAMEEN

There was a notable increase in exploration activity in this region during 1989, due in part to the announcement by Fairfield Minerals Ltd. of its gold discovery on the Elk property (170) near Siwash Lake. This project, which is under option to Placer Dome Inc., focused on a system of epithermal-style quartz veins in the Jurassic Pennask granodiorite. This discovery reflects new and important potential for intrusive-hosted gold mineralization in the area. Fairfield also completed an extensive surface program on the nearby Dill property (171). In the same area Placer Dome operated a major trenching and sampling project on the Spring claims (172) and H. Adams drilled a sulphide-bearing zone on the Gold Core claims (173).

South of Princeton, Similco Mines Ltd. continued a program of exploration drilling at various localities near the Copper Mountain mine, including the Lost Horse Gulch (174) area and the Oriole claims (175). Northwest of Princeton, E. Wedekind and partners drilled the Tor copper-gold prospect (176). Farther west, in the Tulameen ultramafic complex, Tiffany Resources Inc. explored the Lodestone Mountain property (177) for its gold-platinum-iron potential.

At Treasure Mountain (178), near the headwaters of the Tulameen River, Huldra Silver Inc. has continued to evaluate the silver-lead-zinc vein potential. A limited program of underground and surface drilling was carried out in conjuction with geophysical surveys. To the north, in the Coquihalla Lakes area, Blue Gold Resources Ltd. drilled the Keystone prospect (179), a gold-silver occurrence associated with an intrusive breccia.

BRIDGE RIVER - YALAKOM AREA

The traditionally active Bridge River district was noticeably quieter in 1989, as a number of recent major projects were not funded.

The main area of interest moved from the Bralorne-Gold Bridge camp eastward to the Shulaps Range, where MacNeill Industrial Inc. operated a major trenching and drilling program on the Spokane property (180), a gold vein system in the Tertiary Rexmount porphyry flanking the Shulaps ultramafic complex. MacNeill also drilled the Cub 200 copper-molybdenum property (181) to the south. This prospect was discovered during regional mapping in the area by Geological Survey Branch geologists and is also associated with the Rexmount porphyry.

North of the Yalakom River, near Watson Bar Creek, Cyprus Gold Canada Ltd. continued its work on the Second claims (182), where base and precious metals mineralization is hosted in Cretaceous Jackass Mountain Group sedementary rocks.

In the Gold Bridge area the Minto Extension property (183) was drilled by Avino Mines and Resources Ltd. to test gold geochemical anomalies. Farther west, the Gun Creek claims (184) were drill-tested by Hi Tec Resource Management Ltd. At Bralorne, Coral Gold Corporation continued a drilling and trenching program on the Love Oil (Cosmopolitan, 185) property, near the old King mine. Further work on this vein system may be undertaken from underground workings in the Bralorne mine.

REVELSTOKE AREA

A minor surge of activity took place in the Revelstoke area stimulated by the work of Equinox Resources Ltd. on the J&L deposit (186) and by the announcement that Bethlehem Resources Corporation and partners have acquired the Goldstream mine (187). Equinox completed a major underground exploration program early in the year and submitted a prospectus to enter the Mine Development Review Process. Later in the year Placer Dome Inc. became associated with the project by funding pilot metallurgical tests. At Goldstream, Bethlehem Resources completed a limited drilling and sampling program. The company also drilled the Keystone massive sulphide prospect (188) to the south, near Downie Creek.

OPERATING MINES

Mine production in south-central British Columbia during 1989 was affected by labour problems and a temporary slump in gold prices. However, a strong base metal market proved to be the industry's main strength. Two new mines were opened to improve the district's long-term outlook and provide continued incentive and support for a stable exploration environment.

Production at the Highland Valley Copper joint venture (191) totalled approximately 33 million tonnes grading 0.43 per cent copper and 0.01 per cent molybdenum, at an average milling rate of 126 000 tonnes per day. Operations were interupted by a 15-week strike from July 6 to October 21. Earlier in the year the Bethlehem mill was permanently shut down and the HVC milling complex was upgraded by the relocation of the two Highmont mills, bringing the design capacity of the operation to 131 000 tonnes per day.

Minnova's Samatosum mine (192) began full production on July 1 at 454 tonnes per day. Capital costs for construction and development amounted to $30.3 million. As of July 31 diluted reserves were 766 682 tonnes grading 833 grams per tonne silver, 1.6 grams per tonne gold, 1.1 per cent copper, 1.4 per cent lead and 3.0 per cent zinc. Operations are initially planned for a 5-year mine life, with 65 per cent of production from a two-phase pit at an 18.4:1 stripping ratio. The remainder of the ore is to be mined from underground.

Operations at Afton Operating Corporation's Ajax mine (190) began in mid-July following capital and development expenditures of $12 million. The deposit occurs in two zones and will be mined from the East and West pits. Initial reserves for the deposit were reported at 24.7 million tonnes grading 0.46 per cent copper and 0.343 gram per tonne gold. Production for the Afton operation during 1989 was approximately 7500 tonnes per day and totalled 2.6 million tonnes, grading 0.42 per cent copper and 0.21 gram per tonne gold. Approximately 1.28 million tonnes came from the Crescent orebody, which was completely mined out during the year.

The Similco Mines Ltd. Copper Mountain mine (189)operated throughout 1989 at a milling rate of 22 680 tonnes per day. Production for the year totalled 7.5 million tonnes grading 0.449 per cent copper. Current reserves are reported as : proven: 36.3 million tonnes grading 0.454 per cent copper; probable: 27.2 million tonnes grading 0.48 per cent copper and possible: 54.4 million tonnes grading 0.40 per cent copper.

At the Nickel Plate mine (163), Corona Corporation maintained production at 2900 tonnes per day for a total 1989 production of 936 396 tonnes grading 2.88 grams per tonne gold. Current reserves are estimated to be 7.43 million tonnes grading 2.57 grams per tonne gold. Lower than anticipated ore grades have resulted in higher stripping ratios and the recovery process has required higher cyanide and hydrogen peroxide consumption. The company has submitted plans to the Mine Development Steering Committee to place the Canty deposit (166), into production. Reserves for that deposit are 435 000 tonnes grading 3.4 grams per tonne gold, with a 7:1 stripping ratio.

Brenda Mines Ltd. (193) operated throughout the year milling 13.94 million tonnes of ore grading 0.170 per cent copper and 0.035 per cent molybdenum at a milling rate of 32 300 tonnes per day. The mine is scheduled to close in mid-1990.

Teck Corporation's Highland Bell mine (194) at Beaverdell milled 36 300 tonnes grading 308.5 grams per tonne silver, 0.103 gram per tonne gold and approximately 1 per cent combined lead-zinc.

At Hedley, Candorado Mines Ltd. began gold production from its tailings recovery operation (195). The company expected to produce 85 700 grams of gold in 1989 from its first leach pad. Four additional pads are planned for 1990. Reserves are reported to be 1.3 million tonnes grading 1.37 grams per tonne gold. Gold recoveries are approximately 62 per cent or 0.85 gram per tonne.

KOOTENAY DISTRICT

By A. Legun, District Geology, Nelson

INTRODUCTION

The year saw a broad spectrum of exploration activity directed toward precious and base metals, industrial minerals and coal.

In the search for precious metals major companies took the lead from juniors which experienced difficulties in adjusting to the end of flow-through funding and the softening in gold and silver prices. The continued strength in base metal prices slowly translated itself into increased base metal exploration in the Kootenay District. To December 8 there were 255 mineral Notices of Work submitted and 42 placer. This is an increase from 1988 but reflects new regulations where Notices of Work are required for programs of minimal surface disturbance. As in 1988 the activity was concentrated in the Nelson area (82F), but all areas show an increase in Notices of Work with the Cranbrook area proportionally the most significant. Statistics from the government agent indicate 2021 mineral and 104 placer claims were staked in the district.

A number of small industrial mineral projects were undertaken in contrast with nominal activity last year. There were several coal exploration programs with the largest by Crows Nest Resources Limited in the vicinity of the Line Creek mine (224).

One project, the Golden Crown (233) entered the Mine Development Review Process, one seasonally operating mine, Skylark (230) closed and Silvana (232) changed ownership.

TRENDS

The last year or so has seen a substantial increase in staking of areas underlain by Rossland volcanic rocks. Current studies, particularly by Trygve Höy and Kathryn Andrew of the Geological Survey Branch, suggest intrusions which are bracketed in age by the Rossland volcanics and the major granitoid bodies such as the Nelson batholith, have metallogenic significance. The intrusions may be coeval with the volcanics or younger - perhaps precursors to the Nelson intrusions. A substantial number of properties are associated with such intrusive rocks, including Great Western Star (203), Shaft, Rossland claims (196), Katie (211), Kenville (213), Tillicum (198), Second Relief (202) and the inactive Willa. Geologic models being pursued include intermediate subalkalic copper-gold porphyries, skarn, vein and "conformable gold". This latter type has been defined by Höy and Andrew as gold mineralization which is conformable with its sheared and stratabound subvolcanic host. Some of the models have overlapping characteristics. For example the currently inactive but well-researched Willa deposit has been described as a porphyry deposit with a late-stage skarn overprint.

The improvement in zinc prices in 1989 has encouraged evaluation of known low-grade carbonate-hosted lead-zinc deposits such as Duncan Lake (200).

In the Cranbrook area there is further potential for discovering fault-controlled mineralization such as the Bar and Vine (214). Deep-seated fault structures have not been thoroughly prospected. Possible extensions to previously exploited vein structures (*e.g.* St. Eugene) were discovered in 1989.

In the search for another Sullivan deposit, mapping by industry in the last few years has led to the recognition that the favourable stratigraphy (*i.e.* the Lower/Middle Aldridge contact) extends to the southwest toward Creston.

A number of new industrial minerals (magnetite, gypsum, phosphate, fluorite) prospects have recently been discovered. The Kootenays have an abundance of industrial mineral deposits, including the inactive dimension stone quarries, but require the development of effective marketing strategies for their development.

MINERAL EXPLORATION AND PROPERTY DEVELOPMENTS

NELSON AREA (82F)

Antelope Resources Inc. continued its substantial drilling program on the outskirts of the town of Rossland. Work in 1989 focused on the North Belt claim group within the Rossland claims (196) near Monte Cristo Mountain. Massive pyrite-pyrrhotite lenses lie along the sheared intertonguing contact of Rossland monzonite and Rossland volcanics and sediments.

Southwest of Rossland, Minnova Inc. reopened and sampled the Velvet mine (197), and drilled three holes targeting gold-copper-silver replacement veins.

At Tillicum Mountain (198) Esperanza Exploration Ltd. evaluated three different areas: Grizzly, Silver Queen and Arnie Flats. The Grizzly zone was shown to be a skarn hosted by rocks very similar to those at East Ridge. Surface showings suggest lead-zinc and tungsten potential but drilling indicated encouraging values in gold.

Across the valley from Tillicum, at Blue Grouse Mountain, Mike Bapty Research Ltd. oversaw an extensive program of trenching, percussion drilling and bulk sampling at the Millie Mack property (199) of Dragoon Resources Ltd. and Greenstone Resources Ltd. Silver-lead mineralization is associated with several quartz-calcite-graphite zones of cataclasis at the base of a gently dipping tectonic zone of uncertain origin. Gold values are associated with detached and carbonatized bodies of feldspar porphyry within the tectonic zone. The base of the tectonic zone is exposed on the entire periphery of the mountain.

There were a number of exploration programs in the immediate Nelson area. To the south, at Erie, Hawkeye Development Ltd. assessed four additional vein structures near the Second Relief prospect (202), a major past producer of skarn-related gold. At the Great Western Star (203) Pacific Sentinel Gold Corporation is evaluating intrusive and conformable felsic rocks within Rossland volcanics in a heavily drift covered area. At Snowwater Creek on the Whitewater property (204) Teck Corporation is evaluating several targets including a breccia near the contact of Rossland volcanics and Nelson granitic rocks.

To the southwest of Nelson, on the Rely property (205), Pegasus Gold Inc. completed geochemical surveys and drilled a gold-zinc target associated with a felsic intrusion into the basal tuffite of the Elise Formation.

To the north, within the Nelson batholith, step-out drilling by Cove Resources Corporation early in the year indicated remarkable continuity of the Alpine quartz vein (206) and considerable tonnage potential (1 Mt). Subsequent drilling suggested economic grades are localized and Cominco Ltd. did not pursue its option on the property. Nevertheless the vein presents a dip-slope drilling situation and a large target within which higher grade zones may be delineated. Proven reserves were established at about 210 000 tonnes grading 13.7 grams per tonne gold.

East of Salmo on the Sumit property (207) Baloil Resources Inc. intersected gold mineralization within limestones in an area where gold-bearing quartz veins have been previously mined. The property straddles the Salmo lead-zinc and Sheep Creek gold belts and is prospective for base metals as well.

North of Wyndell on the Liz, John, Bid and Rex claims (208) Legion Resources Ltd. explored lead-zinc mineralization in the Proterozoic Kitchener-Siyeh Formation and drilled a soil geochemical anomaly northwest of known showings.

CRANBROOK AREA (82G, 82J)

The search for "sedex" lead-zinc deposits in the Aldridge Formation continued, led by Cominco Ltd. Cominco used mapping, soil geochemistry and an emphasis on deep-probing UTEM geophysics on five claim groups, the largest program being the Kid/Star (209). Other companies actively looking for another Sullivan orebody and focusing on the Lower/Middle Aldridge contact included Chevron Minerals Ltd. (Goatfell, 217), Minnova Inc. (Stoney, 219) and Dragoon Resources Ltd. (McNeil, 218). Chevron has been drilling tourmaline-bearing targets including a breccia (pipe?).

On the Vine property (214) Kokanee Exploration Ltd. trenched and drilled a fault zone containing base metal sulphides in veins and matrix to a breccia. Mineralization is preferentially developed where the fault intersects a more quartzitic unit of the Aldridge Formation. Mineralization consists of sphalerite, galena, chalcopyrite and arsenopyrite. There is exploration activity on the trace of the fault for several kilometres toward the northwest.

In the Flathead area (215, 216) Placer Dome Inc. drilled three different targets in its pursuit of gold associated with Cretaceous alkalic intrusives.

LARDEAU AREA (82K)

On the Duncan Lake property (200) Cominco Ltd. drilled two holes and proved that lead-zinc mineralization exists on the east limb of the Duncan anticline 2 kilometres north of the old Duncan mine adit. Primary mineralization occurs at the contact between Badshot Formation and lower argillites of the Lardeau Group. Ore zones are lenticular and tend to thin down the limb to the east.

Roper Resources drilled on the Red Elephant prospect (201) near Hall Creek. This prospect, known from the turn of the century, has high gold values in a surface zone of oxidized pyritic phyllite and irregular quartz veining. Massive pyrite-pyrrhotite with stringers of chalcopyrite was intersected in a deeper hole below the zone but returned disappointing values in gold. The prospect is near a major fault and there are other showings (lead-zinc in quartz) nearby, suggesting untested targets remain to be evaluated.

GREENWOOD AREA (82E)

The Skylark mine (230), rejuvenated in 1988, closed in April as a result of declining silver prices. Skylark Resources Ltd. also mined about 8000 tonnes from the Sylvester

K (231) massive sulphide deposit nearby with an average grade less than expected.

Early in the year Attwood Gold Corporation completed the second phase of underground development on the Golden Crown property (233), hosted by the same Triassic greenstones as at the Skylark mine. Some spectacular gold grades were intersected in quartz veins.

INDUSTRIAL MINERALS EXPLORATION

A number of small exploration programs were conducted for industrial minerals including gypsum in the Devonian Burnais Formation of the Stanford Range and phosphate in the basal beds of the Fernie Formation in the Flathead area.

Formosa Resources Corporation trenched and sampled the phosphatic intervals on several claim groups (Hunger Lake, Five Cabin) paying particular attention to their potential for rare earths. Yttrium values of over 1000 ppm were identified.

Domtar Construction Materials Ltd. drilled its South Quarry gypsum deposit (220), an area of limited production 1 kilometre south of its active quarry at Lussier River. Westroc discovered a potentially high quality deposit in the Lussier valley (221) and trenched the deposit discovered by Steve Butrenchuk, of the Geological Survey Branch, at Coyote Creek (222).

COAL EXPLORATION

Three coal companies in southwestern British Columbia had significant exploration programs. Fording Coal Ltd. drilled deep holes at Eagle Mountain (223) seeking reserves below the Ewin Pass fault. At the Lake pit four rotary-drill holes demonstrated limits of the pit could not be pushed back. Rotary drill programs at Lake Mountain and Henrietta Creek were designed to determine potential pit limits.

Crows Nest Resources Limited conducted six exploration programs in the vicinity of the Line Creek mine (224). Four were within Coal Lease 4 and there were single programs immediately to the north (Ewin Pass) and south (Teepee). The exploration area covered the east limb and axial region of the Alexander Creek syncline.

Westar Mining Ltd. explored the north end of the Greenhills property in the Cougar 6 & 7 areas (226). Drilling helped define detailed structural geology associated with 16 seam.

OPERATING MINES

At the Silvana mine (232) efforts to access the old Carnation workings at different levels were only partly successful. Surface exploration this year was minimal. Underground development involved mostly drifting and clean-up following the change in ownership from Dickenson Mines Ltd. to Treminco Resources Ltd. Underground drilling at the beginning of the year totalled 3700 metres. Development drilling to the west (faulted extension) was not successful. Present reserves stand at about 29 100 tonnes at about 403 grams per tonne silver, 4 per cent lead and 5 per cent zinc.

In the Crowsnest coalfield Coal Mountain mine (227) underwent a significant expansion and increased output by 0.7 million tonne to 1.6 million tonnes with an approximate doubling of employment. At the Balmer operations (225) of Westar Mining Ltd. development drilling was conducted on Natal Ridge and the Baldy North pit came on stream. At Westar's Greenhills operations (226) 12 000 metres of reverse-circulation drilling were completed to help define coal structure and quality for the current short-range mine plan. At Fording Coal the main effort was consolidation of mining at Eagle Mountain (223).

At Mount Brussilof mine (229) 25 short diamond-drill holes were completed in peripheral areas of the pit. High-grade magnesite was confirmed in the north part of the pit, but not in the south.

CENTRAL DISTRICT

By E.L. Faulkner, District Geology, Prince George

INTRODUCTION

Exploration activity in the Central District reached record levels, with expenditures of more than $40 million. The number of mineral Notices of Work was up sharply from 1988. Placer Notices of Work, however, were down slightly. Interest in alkali porphyry and porphyry-related copper-gold deposits, and major companies with large exploration budgets, were the reasons for the increase in exploration activity. Junior companies were still very active, despite increasing difficulty in raising risk capital.

As in previous years, precious metals dominated exploration targets in the district. Interest in base metals with gold or silver values increased, but was mostly confined to a few major companies.

Once again, there was little interest in industrial minerals, and coal exploration was confined to producing areas or immediately adjacent ground.

HIGHLIGHTS

- Continued exploration success at Mount Milligan, one of Canada's most extensive surface exploration projects.
- The Cirque deposit (lead,zinc,silver) and Mount Polley deposit (copper,gold) entered the Mine Development Review Process.
- Continued strong interest in alkali porphyry and porphyry-related copper-gold targets, especially in the northern Quesnel trough.

TRENDS AND OPPORTUNITIES

Many major companies reported their largest exploration budgets of the decade, and major companies are expected to lead exploration activity in the next few years. Junior companies continue to have funding difficulties, with some choosing to spend limited funds in the district, rather than in more costly frontier areas. However, participation through option agreements or with small programs was the rule.

Interest in alkali porphyry copper-gold targets continued to grow, with exploration activity in the Omineca matching that in the Cariboo. A notable trend in the Omineca was the large number of reconnaissance or initial surface programs on properties staked or acquired by major companies in 1987. To date, follow-up work is planned on a gratifying one-third of these. Encouraging results have also been reported from several projects in Takla volcanics adjacent to the Hogem batholith, and especially in the Witch Lake - Chuchi Lake area. This area has the potential to become a major copper-gold camp.

Another trend has been the re-examination of some older porphyry properties many of which have extensive exploration histories. Work by Imperial Metals Corporation at the Mount Polley copper-gold deposit (formerly the Cariboo Bell) is expected to result in a production decision this spring. Other companies were active on the Fish Lake deposit, the Hanson Lake prospect and on properties in the upper Taseko River area.

Interest in base metal deposits with some precious metal values has been slow to respond to improved base metal prices and the better long-term outlook. Opportunities exist for exploration in the Gataga - Muskwa Ranges and Barkerville - Cariboo Mountains areas. In the Muskwa Ranges, for example, despite improving logistics and known potential, much ground in this Devonian shale belt remains open, and only two major projects were carried out in the area in 1989. Although limited exploration in the Barkerville - Cariboo Mountains area has so far failed to develop economic tonnages, the potential of this region remains high.

SUMMARY OF EXPLORATION ACTIVITY

Mineral Notices of Work received were up 31 per cent from 1988 to a total of 215, setting records for all Mining Divisions. There were 68 drilling or underground projects this year, up slightly from 1988. More than half of the drilling programs were for 10 holes or more. Placer Notices of Work were down 10 per cent from 1988 to a total of 412. Details of selected exploration programs in the district are given in Table 3.

QUESNEL TROUGH

Alkali porphyry or porphyry-related copper-gold targets dominated activity in the Quesnel trough. In the Omineca, despite rapidly improving access, ongoing success at the Mount Milligan deposit and encouraging

results from other properties, much ground has remained open until recently. As a result, the majority of projects were at an early stage of exploration. Target areas were usually selected on the basis of aeromagnetic signatures attributed to intrusions in the host Takla volcanics, with follow-up geochemical work and induced polarization surveys being used to define trench or drill targets.

Exploration has been hampered by lack of outcrop, thick drift cover in places, and the fact, exemplified by Mount Milligan, that alkali porphyry targets may be large and costly to explore. Bulk drift-sample geochemistry and float mapping have been used with some success in areas of thick glacial overburden.

At Mount Milligan (235) Continental Gold Corp. conducted Canada's largest surface exploration project with a budget of $11 million. More than 400 holes were drilled and about 100 kilometres of core recovered. Gold occurs with pyrite and chalcopyrite in potassically altered latites and related volcanic and volcaniclastic rocks of the Takla Group, and in the brecciated contact zone of a monzonite intrusion that appears to underlie much of the mineralized area and subcrops as a small pluton west of the MBX deposit.

More than 180 million tonnes of probable ore grading 0.3 per cent copper and 0.68 gram per tonne gold have been outlined in the MBX and adjacent zones, and more than 90 million tonnes of possible ore of similar grades has been outlined to date in the newly discovered Southern Star deposit south of the MBX zone. Metallurgical and other studies on the property are expected to lead to a feasibility decision for a major open-pit operation, by mid-1990.

At the Windy property (236), south of Mount Milligan, Placer Dome Inc. drilled and trenched a large altered and sheared diorite target, with mixed results. Other targets in the intrusion and host volcanic rocks will be drill-tested.

Black Swan Gold Mines Ltd. conducted a major program of induced polarization surveys, trenching and drilling at the Tas property (237), concentrating on five mineralized shear zones where gold occurs associated with pyrite and magnetite in cherty metasediments and augite porphyry flows adjacent to a diorite stock. An inventory of 25 000 tonnes grading 10 grams per tonne gold or more, with some significant copper values, was outlined in vein widths up to 7 metres.

In the Chuchi Lake area, Noranda Exploration Company, Limited (238) and Digger Resources Inc. (239) explored part of the Chuchi Mountain stock and adjacent andesitic flows at the southeast margin of the Hogem batholith. Digger Resources reported intersections grading from 0.14 to 0.71 per cent copper and 0.27 to 1.34 grams per tonne gold from three holes in altered volcanics. Noranda Exploration reported intersections up to 10 metres with significant copper mineralization and anomalous gold values, mostly in the intrusion. Both companies plan additional drilling.

Major companies active with initial exploration programs on alkali porphyry targets in the northern Quesnel trough included Cominco Ltd. with seven properties north of Prince George, Placer Dome Inc. with five properties, mostly in the Fort St. James area, Rio Algom Exploration Inc. with two properties in the Witch Lake area, and BP Resources Canada Ltd. on properties near or adjacent to Mount Milligan. Noranda Exploration was particularly active, with 17 properties in early exploration stages. Single test holes were drilled on four of six properties in the Mount Bodine area (240), with encouraging results from two of them. Follow-up work is also planned on four other properties.

Best initial results were reported by companies in the Witch Lake - Chuchi Lake area. On the Mitze property (242), for example, Noranda Exploration identified coincident magnetic and soil geochemical anomalies, and found mineralized float with significant copper and gold mineralization.

Noranda Exploration also conducted a late-season drilling program on the Tsil property (243), and drilled the Blackhawk (244) and Nina Lake (245) properties, with mixed to poor results.

Surface work by Kookaburra Gold Corporation at the Col property (241) established the potential for an alkali porphyry deposit, while north of Manson Creek, Lysander Gold Corporation identified another promising alkali porphyry target at the Cat property (246), with an extensive surface exploration program and initial drilling. Significant widths of copper-gold mineralization occur in silicified magnetite-bearing zones in altered volcanics, with grades up to 1.9 per cent copper and 1.7 grams per tonne gold.

In the southern Quesnel trough, exploration work was mostly confined to established properties. Final geotechnical and environmental studies were completed by QPX Minerals Inc. at the Quesnel River gold deposit (247) with a construction start scheduled for late this year. The planned workforce is 26.

At the nearby Mount Polley copper-gold deposit (248), Imperial Metals Corporation completed bulk sampling and geotechnical work. Reserves of 48 million tonnes grading 0.44 per cent copper and 0.58 gram per tonne gold have been outlined in five skarn-like zones of orthoclase-magnetite-chalcopyrite rock in the Mount Polley intrusive stock. Production is planned to start in 1992, at 13 500 tonnes per day, with a workforce of 200.

At other porphyry prospects, Placer Dome Inc. was unable to outline any large targets with surface work at the Mouse Mountain property (249) near Quesnel.

Corona Corporation drilled targets at the Cariboo property (250) near Likely and reported some gold mineralization in silicified andesites that is probably not of porphyry origin.

There was little work done on porphyry targets in the Canim Lake area, as junior companies holding the more promising properties had funding difficulties. GWR Resources Inc. continued to find low-grade copper-gold mineralization in a major trenching program at the Miracle property (251). Other companies active in the Likely-Horsefly area included Brooks Resources Ltd. and Phelps Dodge Corporation Canada Ltd. at the Redgold property (252) where a fragmented land position previously hindered exploration of a promising property.

Elsewhere in the southern Quesnel trough, Eureka Resources Inc. resumed work on the Frasergold basal phyllite hosted gold property (253), with plans for a pilot leach test of a bulk sample.

BARKERVILLE - CARIBOO MOUNTAINS

Mosquito Consolidated Gold Mines Ltd. completed a major program of underground drifting and drilling at the old Island Mountain mine (254). Gold-bearing pyrite replacement ore was found in both the Main Band and Aurum limestones, but insufficient tonnages were found to reopen the mill. Surface work on the adjacent Cariboo Gold Quartz mine, however, identified low-grade gold mineralization in a possible bulk-tonnage target.

In the Cariboo Mountains, Noranda Exploration Company, Limited continued drilling base metal sulphide targets at Indian Lake (255) with mixed results. On other base metal targets, Sable Resources Ltd. planned further drilling at the Maybe property (256) where earlier drilling had failed to find either the vein width or silver values found in outcrop. Cominco Ltd. reported some shallow base metal sulphide replacement mineralization in dolomite in an initial drilling program at the WD property (257). Further work is planned.

PINCHI FAULT TREND

There was increased activity along the Pinchi fault trend, with the attraction of both vein-hosted gold targets in Cache Creek Group sediments and the possibility of alkali porphyry targets in the Takla Group volcanics east of the fault. Listwanite-gold targets, however, have so far proved disappointing.

At the Snowbird property (258) X-Cal Resources Ltd. found that the gold mineralization is associated with arsenopyrite in shear zones in Cache Creek Group sediments, with little in listwanite alteration zones. A drill-indicated inventory of 225 000 tonnes grading 6 grams per tonne gold or better was established and additional ground staked.

Eastfield Resources Limited drilled several talc-carbonate and listwanite alteration zones at the Indata property (259) with mixed to poor results. Surface work however discovered five new quartz-arsenopyrite veins, with some gold grades of more than 10 grams per tonne, and outlined a promising porphyry target.

On the nearby Swan property (260), Northair Mines Ltd. re-examined an old porphyry copper prospect and established drill targets with copper-gold potential. Other companies active in this area with initial programs included Placer Dome Inc. and Westmin Mines Limited in the Tchentlo Lake area (261).

OTHER AREAS

There was some work on the Fraser Plateau, with targets being bulk-tonnage low-grade epithermal mineralization in fractured and silicified Ootsa Lake Group volcanics. Noranda Exploration reported widespread anomalous and low-grade gold mineralization associated with minor pyrite at the HC property (262) but not yet in economic tonnages.

Other companies active on the Fraser Plateau included Westfield Minerals Ltd. in the Gaspard Lake area, BSA Investors Ltd. in the Empire Valley and Blackdome Mining Corporation near Blackdome mine.

A number of porphyry copper deposits or targets in the Fraser Plateau and Coast Range marginal belt received attention. Cazador Explorations Ltd. explored the Hanson Lake prospect (263) and found widespread precious metal and minor base metal mineralization with a percussion drill program. Grades of up to 1.8 grams gold and 80 grams silver per tonne over 2-metre widths were reported, with lower but encouraging grades over longer intersections.

Mixed to encouraging results were reported by Westpine Metals Ltd. from drilling at the Taseko property (264) and by Canmark International Resources Inc. at the nearby Spokane property (265). Westpine Metals Ltd. reported some intersections up to 35 metres grading more than 0.5 per cent copper and up to 1 gram gold per tonne. Cominco Ltd. drilled the Fish Lake copper-gold deposit (266) to obtain fresh core for metallurgical tests.

On other properties, Kleena Kleene Gold Mines Ltd. continued underground drifting on a quartz-arsenopyrite vein system at the Perkins Peak property (267).

In the Muskwa Ranges, Curragh Mining Corporation began a program of underground development and bulk testing at the Cirque property (268) with a mining decision expected this year. Reserves are 18.9 million tonnes grading 2.7 per cent lead, 9.2 per cent zinc and 57 grams silver

per tonne from an inventory of more than 50 million tonnes. Production is planned for late 1991 at a rate of 3500 tonnes per day with a workforce of approximately 250.

At the nearby Mount Alcock property (269), Triumph Resources Ltd. reported economic lead-zinc-silver mineralization with barite in shales over a 300-metre strike length and with widths up to 20 metres. The zone is open at the depth drilled to date.

PLACER

The decline in placer mining in the district was mostly in the smaller operations, which have been most affected by rising costs and stricter reclamation requirements. This trend is expected to continue if the gold price remains stable.

COAL EXPLORATION

Despite changes in the royalty provisions for coal production, coal exploration was again confined to production areas or immediately adjacent ground. This situation is unlikely to change until the current arbitration proceedings to determine the price to be paid to northeast coal producers are settled. Quintette Coal Ltd. (274) in a program of diamond and rotary drilling, showed that the Mesa North deposit extends north into the Wolverine River valley.

OPERATING MINES

The five operating mines in the district continued production at close to previous year's levels (*see* Table 1).

At the Endako mine (270) Endako Mines Division of Placer Dome Inc. continued work on the ultimate pit design.

At Gibraltar mine (271) the electrowinning plant continued to produce cathode copper at capacity, and another dump is to be prepared for leaching. Gibraltar Mines Ltd. began a recalculation of the ore reserves, prompted by the improved prices and outlook for copper.

Blackdome Mining Corporation produced more than 50 000 ounces of gold from the Blackdome mine (272), with ore coming mainly from the southern part of the No. 1 and No. 2 veins. A small tonnage of ore was also recovered from some narrower veins. A program of 2800 metres of decline and drifting from the 1870 level was completed to allow testing of deeper levels of the No 1 and No 2 vein systems.

In the northeast coalfield, Bullmoose Operating Corporation produced 1.8 million tonnes of clean coal from the Bullmoose Mine (273), and Quintette Coal Ltd.produced 4.2 million tonnes of clean coal from the Quintette mine (274).

FAME - FINANCIAL ASSISTANCE FOR MINERAL EXPLORATION PROSPECTORS ASSISTANCE PROGRAM

By J. Pardy, Prospectors Assistance and Training Officer

INTRODUCTION

The 1989-90 Prospectors Assistance Program is a FAME (Financial Assistance for Mineral Exploration) funded $500 000 one-year program to promote prospecting activity in the province by providing training and financial and technical assistance to prospectors. Financial and technical assistance is available through the prospector grant program which is designed to provide part of the risk capital required by prospectors in their search for mineral deposits. Sound, well-conceived prospecting projects are supported with financial assistance up to a maximum of $7500 per year. Prospecting targets eligible for assistance include lode and placer deposits of metallic and industrial minerals (except sand and gravel), and coal deposits. Prospectors have access to technical assistance in the field from ministry personnel active throughout the province. Training consists of the annual Advanced Prospecting Course held at Cowichan Lake, B.C. and several basic courses in centres across the province.

TRAINING

The Advanced Prospecting Course is an 18-day, live-in, field-oriented course comprising practical instruction in geological, geochemical and geophysical prospecting methods. Other topics include law, metallurgy and provincial government acts and regulations. In-class instruction and accommodation are provided at the Ministry of Forests' Cowichan Lake Research Station. The class is limited to a maximum of 32 students - the fee is $425. Applicants must demonstrate basic skills in rock and mineral identification and should have prospecting experience.

The majority of the basic courses offered each year are sponsored by the Ministry of Energy, Mines and Petroleum Resources, the British Columbia and Yukon Chamber of Mines and prospector associations, and are delivered through community colleges. Courses are also sponsored and delivered by the colleges themselves. Cities where courses are available annually include: Victoria, Nanaimo, Vancouver, Chilliwack, Nelson, Kelowna, Prince George and Smithers. Other basic courses are offered at selected times and locations on a cyclical or as-needed basis.

FINANCIAL ASSISTANCE

For the 1989-90 Prospectors Assistance Program applications received by April 7, 1989 were considered for the initial allotment of funds - grants were awarded starting April 20.

Applications received	233
Grants awarded	84
Maximum grant	$7500
Average grant	$4879

The 233 applications received are up 14 per cent and the 84 grants awarded are down 39 per cent from 1988-89 levels, whereas the average grant of $4879 is up 57 per cent from the average of $3109 last year. The trend over the past two years has been a reduction in the number of grants awarded and a substantial increase in the size of the average grant.

Maximum assistance is $7500 per prospector for a pre-approved prospecting project. Fifty per cent of the grant awarded is payable on approval of the application, with the remainder on receipt of a satisfactory prospecting report. Applications for assistance are evaluated on the basis of points awarded for each of the following selection criteria:

Quality and documentation of proposal	45%
Experience and training of applicant	20%
References and recommendations	20%
Financial commitment of applicant	15%

Grantee prospectors are required to submit a prospecting report consisting of two parts, Part A, a summary of prospecting activities and expenditures and Part B, a technical report of activities, to qualify for final payment. Final payment of the grant is made upon approval of the report. The technical reports received will be released to the public domain five years after receipt.

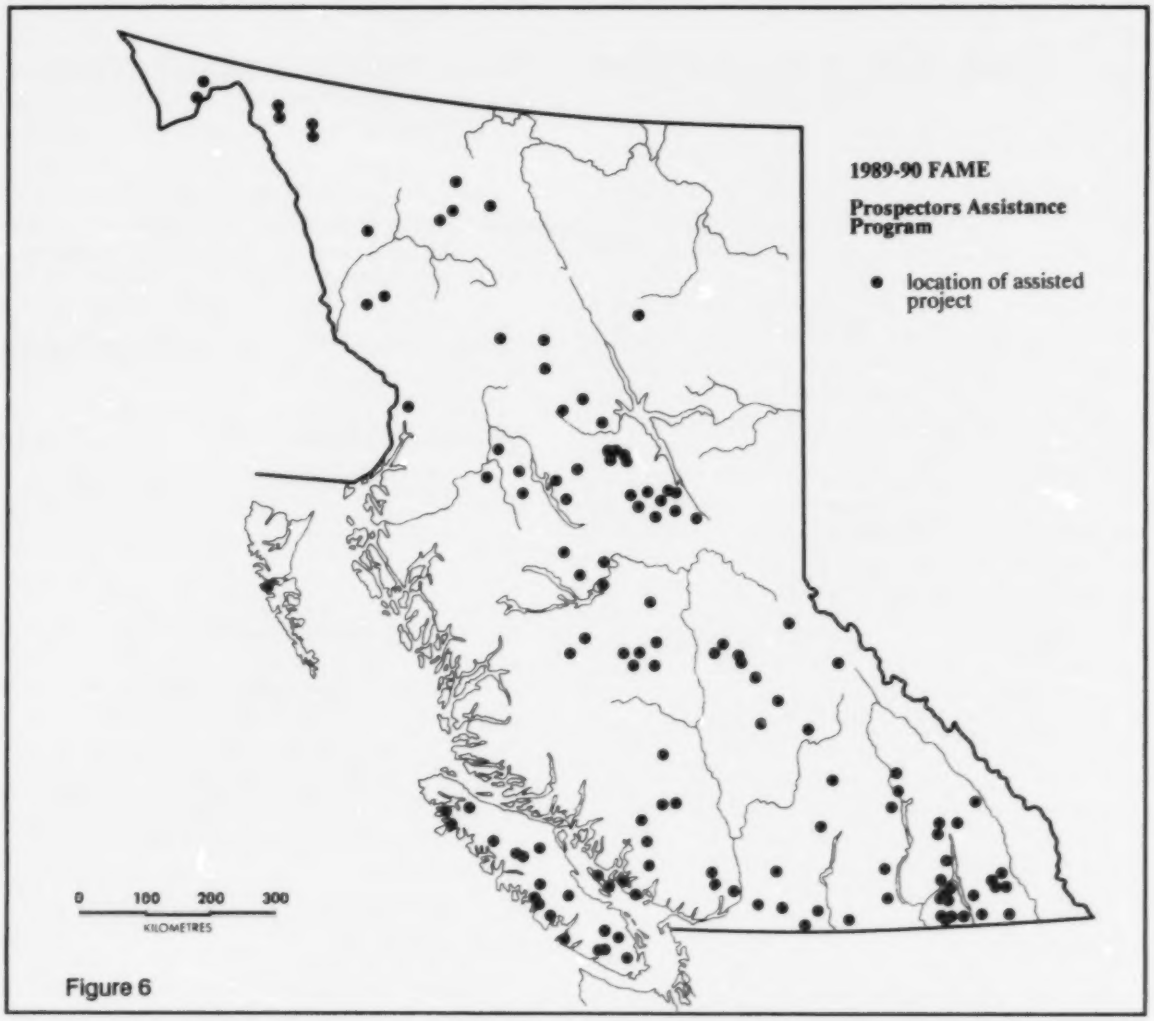

Figure 6

Seventy-seven grantees remain active under the program after seven of the initial 84 successful applicants declined their grants. The 77 active prospectors have a combined total of 129 projects. Most of these projects are located in areas of active exploration and good access. The projects are more evenly distributed in the province as compared to those funded under the 1988-89 program and there has been a significant northward shift in the location of projects (Figure 6).

The percentage of assisted projects by primary target commodity is as follows:

1989-90	
Base metals	4%
Industrial minerals	9%
Placer gold	9%
Precious metals	39%
Base/precious metals	39%
TOTAL	100%

Changes in primary target commodity from the 1988-89 program include decreases in placer gold projects (17.5 per cent to 9 per cent) and hardrock precious metal projects (47.5 per cent to 39 per cent) and increases in base metal projects (1.5 per cent to 4 per cent), industrial mineral projects (4.5 per cent to 9 per cent) and base/precious metal projects (29 per cent to 39 per cent). The trend over the past two years has been significant reduction in the number of precious metal projects and an increase in base/precious metal projects.

RESULTS TO DATE

Twenty-eight summary prospecting reports, representing 36 per cent of the total number of active grants, had been received by December 19, 1989. Many of the prospectors have completed prospecting projects and hold tenure to property which should be evaluated further. Fewer prospectors report option agreements made this

year compared to last - this probably reflects a reduced presence of the junior companies on the exploration scene.

Selected data compiled from the reports noted above are summarized below:

Total prospecting expenditures	$192 850
Average expenditure/prospector	$ 6 888
Grant funds approved	$135 700
Average grant	$ 4 843
Total prospecting days in the field	409
Average prospecting days/prospector	50
Claim units staked	403

The above summary can be used as a measure of the amount of prospecting activity under the grant program, but the effectiveness of the prospecting activity can only be measured by future developments of properties and projects generated under the program. Examples include the Fireweed silver-lead-zinc-copper-gold occurrence (MINFILE 093M 151) located on the west side of Babine Lake which was discovered under the 1987-88 program; in excess of $1 million has been spent on the property and interesting targets have been defined. Under the 1988-89 program a prospector discovered significant gold-silver mineralization on Willoughby Creek east of Stewart and optioned the property to Bond International Gold Inc. The company subsequently acquired additional claims and conducted an exploration program which resulted in a drill intersection of 20.5 metres averaging 24.98 grams gold and 184.21 grams silver per tonne at the Willoughby gossan and a drill intersection of 66 metres averaging 9.88 grams gold and 49.29 grams silver per tonne 6 kilometres to the west at Red Mountain.

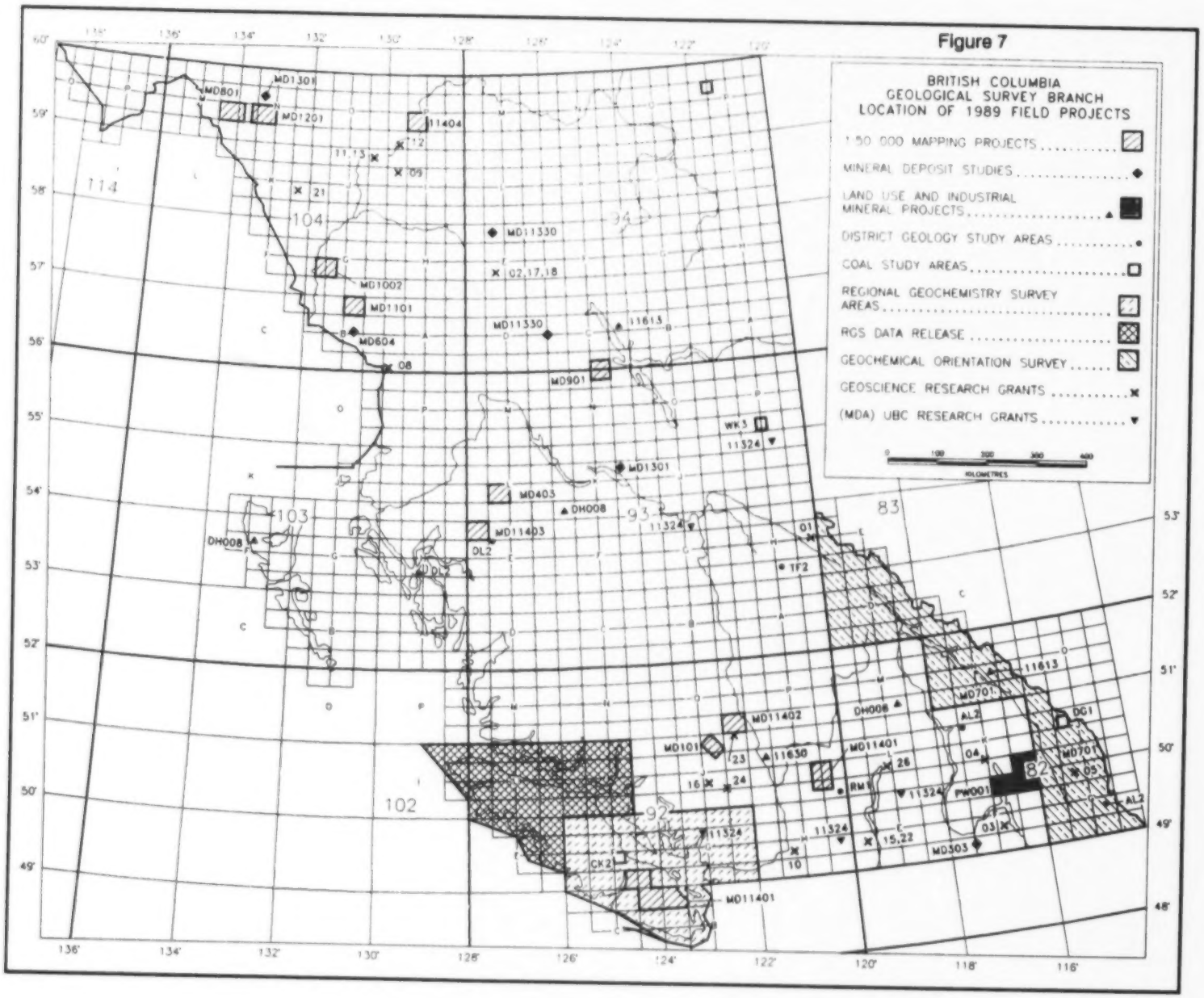
Figure 7
BRITISH COLUMBIA
GEOLOGICAL SURVEY BRANCH
LOCATION OF 1989 FIELD PROJECTS
1:50 000 MAPPING PROJECTS
MINERAL DEPOSIT STUDIES
LAND USE AND INDUSTRIAL MINERAL PROJECTS
DISTRICT GEOLOGY STUDY AREAS
COAL STUDY AREAS
REGIONAL GEOCHEMISTRY SURVEY AREAS
RGS DATA RELEASE
GEOCHEMICAL ORIENTATION SURVEY
GEOSCIENCE RESEARCH GRANTS
(MDA) UBC RESEARCH GRANTS
KILOMETRES
MD801
MD1301
MD1201
MD1002
MD1101
MD604
MD11330
MD901
MD1301
MD403
MD11403
DH008
MD11402
MD101
MD11401
MD701
MD303
11404
11613
11324
11630
02,17,18
08
WK3
DL2
TF2
AL2
DG1
PW001
CK2
RM1
114
104
94
103
93
83
102
92
82

1989 FIELD SEASON
GEOLOGICAL SURVEY BRANCH

Part of the Branch mandate is to produce and interpret geological data that will aid government policy decision making, and encourage and guide private sector exploration to the ultimate benefit of all the citizens of British Columbia. Activities in support of this mandate during 1989 are briefly described in this report.

MINERAL DEPOSITS AND REGIONAL MAPPING SECTION

Mineral deposits studies and regional mapping projects are on-going throughout the province. They focus on districts of known high mineral potential and areas that we feel are under-explored. Each project updates MINFILE for mineral showings visited. Mapping projects also include the collection of stream silt samples to integrate with and augment the Regional Geochemical Survey (RGS) program. Mineral deposits projects concentrate on the geologic setting and controls of mineralization to produce widely applicable genetic models.

Following are brief descriptions of the projects and summaries of their achievements during the 1989 season. Ongoing projects extended work begun in previous years. Two, the Rossland and Taseko - Bridge River projects will be highlighted to give the flavour of our studies; results from the remainder are briefly summarized.

A new study of **precious and base metal skarns** was started by Gerry Ray and Ian Webster. Initial work during a shortened field season was on Texada Island, examining the geologic setting of copper and iron skarns. These deposits provide examples of typical Insular Belt skarns related to the Jurassic Island plutonic suite.

The new **Listwanite project** is investigating the relationship between this type of carbonate-mariposite alteration, ultramafic rocks and gold mineralization in rocks of the Cache Creek Group. It will also study the tie, if any, with faults and granitic intrusions that are commonly spatially associated with listwanite alteration zones. Areas near Atlin, Cassiar and Fort St. James have been examined in the field and samples collected will be studied petrologically, geochemically and radiometrically.

In the **Rossland project** Trygve Höy and Kathryn Andrew are studying the volcanic, plutonic and sedimentary rocks of the Late Triassic to Early Jurassic Rossland Group. This work will determine the structural and stratigraphic setting and controls of shear-related gold, alkali gold-copper porphyry, skarn and vein mineralization in the Nelson-Rossland area. The Rossland camp has produced more than 84 000 kilograms of gold and 105 000 kilograms of silver; in British Columbia, this precious metal production is second only to that from the Bralorne camp. Elsewhere in the Rossland Group, recovery from the combined Nelson and Ymir camps was more than 16 750 kilograms of gold and 190 000 kilograms of silver.

Mapping documents dramatic thickness and facies changes in the Archibald Formation, the basal succession of the Rossland Group, that indicate an evolving tectonic high in the area underlying Trail and Rossland. This Pennsylvanian or Permian Mount Roberts Formation high influenced deposition of overlying volcanic rocks of the Elise Formation, which formed in a complex island arc and basin environment. In the Nelson area, effusive volcanism occurred in the west and local volcanic islands shed debris southward. Near Salmo, epiclastic deposits near the middle of the formation record a hiatus in the volcanic activity.

Mineral deposits in the area are structurally and lithologically controlled. Key elements are proximity to comagmatic or later intrusions, host lithology (volcanic rocks host copper-gold deposits, sedimentary rocks host lead-zinc deposits) and previously unrecognized structures.

In the **Taseko - Bridge River project** Paul Schiarizza and Bob Gaba are mapping to provide 1:50 000-scale geological maps for the northeastern side of the Coast Range from Taseko Lakes to the Bridge River area. The geological data will be used to assess the mineral potential, especially for precious metal mesothermal to epithermal veins, porphyry copper-gold or copper-molybdenum and skarn deposits. Also important is the goal of interpreting the tectonic evolution and faulting history, particularly as it relates to mineralization.

The geological framework of the area consists of:

- Bridge River complex: oceanic volcanic and associated intrusive rocks, cherts and argillites imbricated on all scales; includes limestone layers and olistoliths, clastic rocks and, locally, blueschists
- Cadwallader "terrane": Upper Triassic arc-related volcanic and sedimentary rocks of the Cadwallader and Tyaughton Groups and overlying Lower to Middle Jurassic shale
- Shulaps ultramafic complex: a dismembered ophiolite suite with harzburgite mantle tectonites capping the Shulaps Range and structurally underlain by serpentinite mélange derived from ultramafic cumulates, gabbros, mafic to intermediate dikes and pillowed greenstones

- Middle Jurassic to Upper Cretaceous marine sediments to nonmarine sediments and volcanics of the Tyaughton basin and Battlement Ridge Group respectively
- Tertiary volcanic and intrusive rocks

The Cadwallader fault system and mesothermal gold mineralization in the Bralorne camp are probably related to development of mid-Cretaceous transpressional faults with sinistral offsets. Thrusts, folds and steep faults formed throughout the region at this time. These were later cut by Late Cretaceous(?) to Eocene dextral strike-slip faults. Important low and high-angle normal faults in the southeastern part of the area were synchronous with and/or later than the strike-slip faulting.

During mapping this summer our crews found molybdenite mineralization in and adjacent to the Eocene Mission Ridge pluton leading to a drilling program by the property owners.

Farther north, two regional mapping projects are underway south of Smithers. Don MacIntyre and Pat Desjardins extended coverage southward in the Telkwa Range and Larry Diakow and Jay Timmerman extended mapping northward along the eastern side of the Coast Range complex into the Morice Lake area. Stratabound sulphides, epithermal veins and porphyry copper-molybdenum deposits are exploration targets in the area.

The **Telkwa project** has completed four 1:50 000-scale map sheets in the Smithers-Telkwa area. In 1989 mapping was completed on NTS sheet 93L/6, selected, in part, because stream sediments in this map area are anomalous in gold. Additional silt geochemistry and mapping were required to better define the areas of highest mineral potential. The area is part of the Stikine Terrane and includes calcalkalic island arc volcanic and sedimentary rocks of the Jurassic Hazelton Group and Jurassic and Early Cretaceous successor basin sediments of the Bowser and Skeena Groups, which contain important coal measures. The mapping allowed more detailed subdivision of the Lower Jurassic Telkwa Formation in its type area and located volcanic and plutonic centres which are areas of higher than average mineral potential.

The **Whitesail project** has covered the equivalent of three 1:50 000-scale map sheets. In 1989, mapping in NTS 93E/13 and 93E/14 was designed to extend coverage northward and to tie on to mapping published in Bulletin 75 by D.G. MacIntyre (1985). This area is along the eastern edge of the Coast plutonic complex and has precious and base metal potential.

Hazelton Group strata in the area form a thick, easterly facing homocline. The succession thickens from southeast to northwest and is thickest in the Nanika Lake area, where there is a large volume of mafic and felsic volcanic rocks. Plutonic and metamorphic rocks of the Gamsby complex were thrust eastward over the Hazelton rocks in Late Jurassic time. These thrusts were reactivated during the Late Cretaceous and Eocene. The area is also intruded by Middle Jurassic, Late Cretaceous and Tertiary granitic plutons. This area has potential for copper-molybdenum porphyries like the Berg deposit, stratabound sulphide and skarn deposits like the Boulder occurrence, and epithermal gold deposits like the New Moon prospect.

In the Johanson Lake to Manson Creek area, in the north-central part of the province, two projects are in progress. Fil Ferri and Dave Melville extended 1:50 000-scale mapping northward from Germansen Lake. Graham Nixon and Jan Hammmack completed the field component of a study of the mineral potential of Alaskan-type ultramafic bodies in British Columbia.

Mapping at 1:50 000 scale in the Manson Creek area, along the boundary between the allochthonous Intermontane Belt and the North American Omineca Belt, is to understand the area's geologic, tectonic and metallogenic history. The area has known placer and lode gold, porphyry copper-gold and rare-earth element deposits, and potential for base metal deposits.

It was found that late Proterozoic to middle Paleozoic carbonates and siliciclastic rocks of the Slide Mountain Group correlate well with units exposed in the Sylvester allochthon well to the north, near Cassiar. Late Triassic Takla volcanics and sediments, which underly the southwest edge of the 1989 map-area, have porphyry potential. Base metal possibilities are indicated by lead-zinc-barite-silver mineralization found by the crew near the top of the "Echo Bay group", a carbonate package 1000 metres thick, conformably overlying the Cambrian Atan Group.

The **Ultramafic project** is designed to evaluate the potential of mafic and ultramafic rocks in the province for economic concentrations of platinum group elements and other commodities. Work to date has concentrated on Alaskan-type ultramafic bodies. Fieldwork was completed on the Lunar Creek, Polaris, Wrede Creek and Johanson Lake complexes. Locally, Lunar Creek has spectacular layering like that seen on Duke Island in Alaska. The Polaris complex is interpreted to be a thick mafic-ultramafic sill. Lithogeochemical results from five samples from chromitite layers in the Wrede body show anomalous concentrations of PGEs - from 120 up to 2300 ppb platinum. A preliminary interpretation of these ultramafic rocks is that they represent cumulate piles below island arc volcanoes, some of which appear to have been shoshonitic.

Two mapping projects and the new listwanite mineral deposits project were active in the Atlin-Tagish Lakes area of northernmost British Columbia. The mapping projects are producing 1:50 000-scale geological coverage

in this area of placer and lode gold potential. They have spurred mineral exploration along the Llewellyn and Nahlin faults and in the Proterozoic(?) to Paleozoic "Boundary Ranges metamorphic suite".

The **Tagish project** is being undertaken by Mitch Mihalynuk and Keith Mountjoy. This anomalous arsenic-antimony province contains several known gold-silver deposits, including the old Engineer mine. Mapping in NTS sheets 104M/8 and 104M/9E attempts to define metallotects and evaluate resource potential through mapping geological units and structures, and conducting lithogeochemical amd moss-mat geochemical surveys.

Mesozoic stratigraphic units of the Stuhini and Laberge Groups were subdivided and traced throughout the map area. Attention was also given to Proterozoic(?) to Paleozoic, mainly metasedimentary, rocks of the Nisling Terrane and intrusive rocks of the Coast plutonic complex. Within the metamorphic rocks, pre-Triassic granodiorites are deformed by ductile, top-to-the-south shears that are offset by brittle, dextral and down-to-the-east faults that are probably related to the Llewellyn fault system. The Llewellyn fault is a long-lived and deep-seated structure. The latest movements created a zone of brittle deformation that hosts synkinematic mineralized veins. The fault is a metallotect of interest. A major zircon-based dating study of the Mesozoic rocks will attempt to better constrain rock ages and timing of fault movements and mineralization.

The focus of the **Atlin project** by Mary Anne Bloodgood and Kim Bellefontaine is the Cache Creek Group. Imbricate slices of a dismembered ophiolite suite within the Cache Creek rocks are the apparent source of placers in the Atlin camp and may host lode gold deposits. Mapping south from Atlin revealed southeasterly directed thrust faults and associated north-trending tear faults in the Cache Creek Group. These major structures, and the Nahlin fault, are metallotects for precious metals. Late northeast-striking faults that cut the Tertiary Sloko volcanics and older rocks may be targets for epithermal gold exploration. The Cache Creek Group is a mélange complex, but local coherent, fault-bounded stratigraphic blocks have been mapped.

The **Listwanite project**, with Chris Ash and Ron Arksey, will map and sample known and suspected listwanite occurrences in oceanic terranes in the province. The purpose is to develop a model to explain their origin(s) and tectonic settings, and to determine their relationship to precious metal and possibly PGE mineralization.

Formation of listwanite involves carbonatization of serpentinized ultramafic rocks generally in and above faults. During the field season, work was carried out in the Atlin, Cassiar and Fort St. James areas. In Atlin, allochthonous residual upper mantle rocks rest above thrusts that dip northwest. Bedrock exposed by placer operations shows tectonic mélange zones and the effects of faulting and alteration. Cassiar listwanites are interpreted to be derived from serpentinites strung out along thrust faults. Near Fort St. James, the targets are thrust faults with carbonate alteration and quartz veins with associated antimony and gold. The project will investigate timing of mineralization and alteration, lithotectonic setting and environment of formation of associated ultramafic rocks and basalts, timing and relationships of spatially associated granitic rocks, and fluid inclusions in included quartz veins.

Three projects are continuing in the exciting "Golden Triangle" of northwestern British Columbia.

In the **Stikine project** Derek Brown and Charlie Greig traced stratigraphic units mapped in 1988 northward, to resolve internal stratigraphy and contact relationships between Triassic, Jurassic and Upper Cretaceous to Tertiary rocks that underlie the area and to evaluate their mineral potential. Regional unconformities have been documented at the base of Lower Jurassic volcanic rocks and Upper Cretaceous to Tertiary sedimentary rocks. Radiometric dating and fossils should further constrain the ages of Lower to Middle Jurassic volcanics and sediments, and the timing of deformation in the area. Several narrow, volcanic-hosted base metal veins were discovered; some are related to Tertiary dikes in limy host rocks.

In the **Iskut North project** Jim Logan and Victor Koyanagi mapped southeastward to the Forrest Kerr area and extended their coverage as far south as the Iskut River to tie onto the Iskut-Sulphurets project. The Forrest Kerr area includes the McLymont Creek gold prospect, where mineralization is semiconformable and structurally controlled. Mapping defined an Early Jurassic volcanic package that apparently correlates with the Betty Creek/Spatsizi Group; similar rocks host the Eskay Creek deposit. The area contains a western package of relatively undeformed Paleozoic rocks separated from a penetratively deformed eastern package by a composite Jura-Cretaceous pluton.

The objective of the **Iskut-Sulphurets project** is to provide an up-to-date geological and mineral deposit database for the Iskut-Sulphurets gold belt that will lead to development of ore deposit models to aid exploration and resource potential assessment. Dani Alldrick, Jim Britton, Mary MacLean and Kirk Hancock extended coverage westward to cover Johnny Mountain and the Snip area. Detailed mapping was completed on the Eskay Creek, Johnny Mountain, Inel and Nickel Mountain deposits and on the Colagh prospect. Interaction with industry geologists in the area was extensive and helpful.

A provisional stratigraphic column derived from work in the Snippaker sheet has been established and corre-

lated with rocks to the east and south. The Jurassic stratigraphic column established differs from that in the Sulphurets and Stewart areas, although the key Mount Dilworth felsic volcanic unit continues. The spectacular drill results on Calpine's Eskay Creek property sparked a flurry of company activity late in the season. Open File maps from last year's work on the project were in wide use and a map of the Johnny Mountain area by Dave Lefebure and Mike Gunning (OF 1989-28) was released at the Bronson "symposium" held in August.

Several projects are now in the write-up phase, with little or no fieldwork undertaken this season. These are:

Bridge River	Neil Church
Quesnel	Andre Panteleyev
Hedley	Gerry Ray
Sicker	Nick Massey
Midway-Cassiar	JoAnne Nelson

DISTRICT GEOLOGY UNIT

The District Geologists maintain an up-to-date inventory of mineral deposits and monitor exploration trends and development in their districts, promote the mineral potential of their districts, provide input to the Mine Development Review Process and the Land Use Review Process, offer advice to explorationists, other government agencies and the general public, and assist in the administration and delivery of the Prospectors Assistance and Training Program. All District Geologists are also involved in specific field studies aimed at augmenting and improving the provincial geoscientific database.

In the Northwestern District, Dave Lefebure in cooperation with Alan Campbell, began a study of gold deposits on Porcher Island and nearby areas, and of the applicability of computer-based expert systems to the understanding and discovery of these deposits. Dave also continued with metallogenic studies of volcanogenic massive sulphide deposits and, in cooperation with Mary Lou Malott, continued studies of precious metal deposits in the Tertiary Ootsa Lake volcanic rocks of the Nechako Plateau. All of these activities will produce mineral deposit descriptions and compilation maps to be used in developing ore deposit models.

Ted Faulkner initiated a compilation of geological, geophysical and geochemical data and a description of copper-gold porphyry-type deposits in the Omineca Belt between Fort St. James and Germansen Landing.

Rick Meyers continued his study of the distribution, setting and character of precious metal lode deposits in the Okanagan-Kamloops region. This study will result in a regional compilation of geochemical, petrographic and geological information for the deposits studied.

For the Kootenay region Andrew Legun, assisted by Andrew Skupinski, completed his study of the Cretaceous alkalic intrusions and associated gold deposits of the Twentynine Mile Creek area. Andrew also carried out detailed mapping and a study of gold mineralization at the Millie Mac property east of Burton.

Paul Wilton continued his studies of lode gold deposits in the southern Coast Mountains and on Vancouver Island, with emphasis on the relationships between mineralization and Tertiary volcanism, tectonics and alteration zones.

COAL RESOURCES UNIT

1989 was an active year for the Coal Subsection. Major activities included field mapping, coal-quality surveys, drilling and coalbed methane investigations.

Field mapping at a scale of 1:50 000 was carried out in the Tumbler Ridge area by Ward Kilby and Jim Hunter. This season's effort completes the mapping for this multiyear project. Barry Ryan and Henry Kucera conducted a regional survey of the Upper Cretaceous coal potential in the outer foothills and plains of northeastern British Columbia. At Telkwa, Regan Palsgrove and Marc Bustin investigated the stratigraphy and structure of the deposit. On Vancouver Island, Corilane Bickford and Candace Kenyon expanded the mapping of the Comox coalfield.

Studies of the coal quality of the province's coal resources remained our major effort. To this end Dave Grieve and Brad Van Den Bussche sampled all the producing mines in the Rocky Mountain region. Alex Matheson directed a small-diameter drill sampling program in the Telkwa area. Vitrinite reflectance analyses using the Crossplot method revealed that the vast majority of our coals have biaxial reflectance characteristics.

During the year the search for coalbed methane became a major industry initiative. To address the void of knowledge in this field in Canada, we sponsored a short course on the subject. In addition, Henry Kucera started a multiyear study of the coalbed methane potential of northeastern British Columbia through an M.Sc. program at the University of Victoria. The strong interest in this resource on Vancouver Island continues and is being addressed by Candace Kenyon.

A *Coal Quality Catalogue* and a *Coal Quality Brochure* were released during the year. These publications are directed to the international market and have been distributed around the world. Dave Grieve neared the end of his work on a bulletin on the Elk Valley coalfield. Paper 1989-2 *Stratigraphy of the Elk Formation in the Fernie Basin,* by Dave Grieve and Neil Ollerenshaw (GSC) was also released. Alex Matheson is compiling a publication on the thermal coal resources of British Columbia.

INDUSTRIAL MINERALS UNIT

The Industrial Minerals unit carries out both field and office based studies that range from regional geological studies to site-specific studies. All of these contribute to one or more of the following strategies:

- To encourage replacement of industrial minerals imported to British Columbia.
- To develop new export markets for these minerals.
- To encourage increased value added mineral processing within British Columbia.
- To identify opportunities for development of or substitution by environmentally friendly minerals.

The assessment of perlite and vermiculite occurrences for their development potential was conducted by Gary White. The project involved mapping, sampling and testing of nine occurrences of perlite and two of vermiculite. Nine bulk samples were shipped to CANMET, Ottawa, for laboratory testing to assess whether commercial product specifications can be met from these occurrences.

In addition to the Frenier deposit, which saw production from 1983 through 1985, perlite from Uncha Lake and Francois Lake, as well as from two sites near Port Clements on Graham Island, exhibited expanding properties during blow-torch tests in the field. Vermiculite showings near Sawchea Creek and Joseph Lake occur within major intrusive bodies. If the laboratory tests indicate that commercial product specifications can be obtained then the Fraser Lake area may have significant potential to host major deposits of vermiculite.

As a part of barite inventory project, Steve Butrenchuk investigated the Wigwam River, Larrabee, Brisco and Fireside occurrences in the field. The former two are potential prospects while Brisco and Fireside are past producers.

MINERAL INVENTORY SECTION

MINFILE, the Branch computer mineral inventory database, published 27 map sheets in 1989. These releases contain descriptions of 2399 occurrences or 23.6 per cent of the total database of 10 168 occurrences. At this time about 41 per cent of the entire database has been released in the new MINFILE format and a further 20 per cent is being prepared for release. The data are published as hardcopy printouts, floppy diskettes and mineral inventory maps. During the year 560 occurrences were coded for release in 1990. In addition an upgraded version (2.13) of MINFILE/pc was released. A report generation module was added to the basic search program routines.

MINERAL LAND USE UNIT

The Land Use unit provides a centralized and coordinated response to all land use planning and policy issues facing the Ministry. This includes field studies to estimate the mineral potential of large areas proposed for withdrawal from mineral exploration and mining, to office based reviews.

In the Mineral Land Use unit, a mineral potential study of the Purcell Wilderness Conservancy and the surrounding area was begun in 1989 by Graeme McLaren and Gregg Stewart. The conservancy is underlain by Proterozoic rocks of the Purcell and Windermere Supergroups in the east and by Paleozoic rocks of the Kootenay arc in the west; these are intruded by two Cretaceous batholiths and numerous minor stocks. The Sullivan silver-lead-zinc orebodies are located just to the south and the Mineral King mine, a past producer of lead, zinc, silver and barite, lies on the northern boundary of the study area. Other vein and skarn occurrences are also known. The information gained in this study will aid in determining the ultimate boundaries of a provincial park in the area.

Mapping this year was undertaken in the eastern half of the study area in conjunction with a stream sediment geochemical survey and a prospecting and lithogeochemical sampling program. Host rocks for the Sullivan mine underlie the southeast corner of the study area. Similarities with the Sullivan environment and the presence of small lead-zinc vein occurrences indicates that this area warrants continued exploration. Vein occurrences with tin and tungsten mineralization also occur near the contact with the White Creek batholith in this southeast part of the area. Initial results in the north show a more complex structural setting than previously recognized. Extensive zones of asymmetric folding and thrust faulting repeat stratigraphy and, in places, have been invaded by quartz-barite veins carrying copper, lead or zinc mineralization. Following compilation of geochemical and stratigraphic data further mapping and prospecting will be undertaken in this northern part of the study area. In 1990 all surveys will be extended to cover the western half of the conservancy and surrounding areas of interest.

APPLIED GEOCHEMISTRY

Data released through the Applied Geochemistry Subsection in June, 1989, from samples collected in 1988 on northern Vancouver Island and the adjacent mainland stimulated considerable exploration interest and activity. Over 125 copies of the dataset were sold on release day; to date sales total in excess of 200 sets and 80 floppy diskettes.

In the summer of 1989, Regional Geochemical Surveys covering southern Vancouver Island and the Lower Main-

land were conducted. Approximately 2430 sediment and water samples were collected over 25 000 square kilometres at an average density of one site every 10.5 square kilometres. As in 1988, moss-mat sediments samples were collected on Vancouver Island (1397 sites) and stream sediments were collected on the mainland (1033). The release of the results is scheduled for June 1990, with release centres in Nanaimo and Vancouver. The 1989 RGS orientation surveys were conducted in the eastern Rocky Mountains in preparation for next year's RGS sampling program.

The subsection is additionally involved in producing a report on the stream sediment geochemistry of the Purcell Wilderness Conservancy. The report includes data from sediment samples collected during the 1989 field season and archived RGS sediment samples collected in 1977. The samples have been analyzed for gold plus 33 other elements by neutron activation analysis. The samples were also analyzed for copper, lead and zinc using atomic absorption.

QUATERNARY GEOLOGY

After a hiatus of several years, the Ministry of Energy, Mines and Petroleum Resources has reinstated a program in Quaternary geology, under the aegis of the Geological Survey Branch. The newly created Surficial Geology Subsection forms part of the restructured Applied Geochemistry and Surficial Geology Section. The Subsection will address public, industry, and government needs related to Quaternary geology in the province.

Several geologic themes currently comprise the terms of reference for the subsection: placer, drift exploration, sand and gravel assessments, geological hazards, and surficial mapping. It will attempt to stimulate both placer and mineral exploration in areas of thick or geologically misunderstood drift cover by providing useable base data compilations and information case studies. Moreover, the implementation and coordination of a Geological Hazards Program will answer industry needs for a provincially based advisory (non-policy making) group, and public needs for a government-sponsored source of hazard information. Sand and gravel resource location and management will be an important function.

Field research in 1989 centred primarily on placer deposits in the Cariboo district of central British Columbia. Detailed sedimentological and stratigraphic mapping of freshly exposed sections at active placer operations provided a base for modelling preglacial placer occurrences in the province. Additionally, an integrated drift-exploration case study was started in north-central British Columbia. Initial field reconnaissance was undertaken in late October. Several case studies in differing glaciated environments are planned to provide industry with examples illustrating the use of varied Quaternary geological techniques for drift exploration. The Subsection is actively participating in fieldwork on neotectonics on southern Vancouver Island. Identification and sampling of buried and exhumed Holocene peat bodies provide data for a regional sea-level history compilation.